

WATER AND SEDIMENT QUALITY IN EVAPORATION BASINS
USED FOR THE DISPOSAL OF AGRICULTURAL SUBSURFACE
DRAINAGE WATER IN THE SAN JOAQUIN VALLEY, CALIFORNIA

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EXECUTIVE SUMMARY

Between 1985 and 1987, Regional Board staff conducted three water and sediment quality surveys of the 27 existing evaporation basins used for disposal of subsurface agricultural drainage water. Basins in the San Joaquin Valley are located from the Bakersfield area in the south to near Gustine in the north. Facilities cover 7,160 acres (2,900 hectares) with basin sizes ranging from 10 to 1,800 acres (5 to 730 hectares). Water quality samples for total selenium, selected trace elements and minerals were taken from each of the 89 individual basin cells and 53 basin inlets that contained water at the time of the surveys. Sediment samples were taken from the upper 7 cm layer of each basin cell bottom that contained or had contained subsurface drainage water. Sediment samples were analyzed for selected trace elements including selenium. The water and sediment quality data will be used to evaluate the need for regulatory actions in relation to the Porter-Cologne Water Quality Control Act, including Subchapter 15 requirements and the requirements of the Toxic Pits Cleanup Act(TPCA).

Inflow quality to the evaporation basins varied widely. Total dissolved solids (TDS) concentration ranged from 1,200 to 51,350 mg/L with a geometric mean of 13,400 mg/L. The geometric mean rather than the simple mean is used here because the water quality concentrations are positively skewed in a log-normal distribution. The water being discharged into the basins was a sodium sulfate or sodium sulfate-chloride type water with the chloride-sulfate ratios typically less than 0.5. This is in contrast to seawater which has a TDS concentration of approximately 31,000 mg/L with a chloride-sulfate ratio approaching 10.

Inflow trace element concentrations, although varying widely between sites, appeared to show a relationship with the geologic settings of the basins. Inlets on alluvial fan areas showed a geometric mean selenium concentration of 300 ug/L, as compared to 2 and 12 ug/L for those inlets on the basin-trough or lake-bed deposits, respectively. Molybdenum and arsenic concentrations in the inlet samples also showed a strong relationship to the geologic setting. However, in contrast to selenium the highest concentrations were found in inflow samples for basins located on lake-bed deposits. Consistently high arsenic concentrations were associated with inflow samples for basins in the southern half of the Tulare Lake Bed, while the highest molybdenum concentrations were associated with basin inflows in the Goose Lake Bed Area. Boron concentrations did not show a definite relationship to geologic setting. None of the basin inflow water concentrations exceeded the hazardous waste levels established in Title 22, California Code of Regulations (CCR), Section 66699.

Evaporation basin constituent concentrations reflected inflow quality and the degree of evapoconcentration. In those basin cells operated "in-series" where final evaporation takes place, the influence of evapoconcentration is strong. TDS concentrations ranged from 2,675 - 388,000 mg/L; the latter concentration being over 12 times that of seawater.

Trace element concentrations varied widely, but did show that future monitoring efforts should be directed at four trace elements; selenium, molybdenum, arsenic and boron. Each of these elements occurs in high concentrations in one or more of the basins. Only one basin has exceeded the hazardous waste limit for selenium and one sample from another basin exceeded the hazardous waste limit for total arsenic in the final stages of evaporation to dryness. However subsequent sampling at this site has not confirmed the original high arsenic level.

High selenium values occurred in a few widely scattered basins. Only 3 basins, accounting for 15 percent of the total surface acreage, had total selenium exceeding 100 ug/L. Only 50 acres of evaporation basin cells had selenium concentrations that exceed the hazardous waste limit of 1,000 ug/L. The high values are all within one basin site. Thirty percent of the ponded acreage of the evaporation basins had total selenium concentrations less than the present drinking water standard of 10 ug/L. The remaining fifty-five percent had total selenium concentrations between 10 and 50 ug/L.

High concentrations of molybdenum, arsenic and boron were also found in several evaporation basins. Molybdenum concentrations in the evaporation basins were generally high, with over sixty percent of the basin acreage showing concentrations in excess of 2,000 ug/L. Arsenic concentrations varied by site, with only 17 percent of the acreage exceeding 225 ug/L, which is the approximate arsenic concentration of the Great Salt Lake in Utah. The trace element that occurs in the basin cells in the highest concentration is boron with values ranging from 2.5 to 840 mg/L. None of the molybdenum, boron or arsenic concentrations exceeded the hazardous waste level except for the one arsenic sample that was discussed earlier. No conclusions with regard to designated waste levels can be made because a complete evaluation of site characteristics and background water quality underlying each site is needed as these will play a major role in determining application of Subchapter 15 of Title 23, Chapter 3 of the California Code of Regulations(CCR).

The available data indicate that cadmium, chromium, copper, lead, mercury, nickel and zinc, if present, are at relatively low concentrations in the evaporation basins. In no instance do these concentrations exceed the hazardous waste levels or designated levels regardless of site conditions. Efforts are presently underway to more accurately measure these low levels.

Trace element concentrations in sediment were low in relation to the hazardous waste limits and likely designated waste levels. There appeared to be a relationship between selenium content in the sediment and the geologic setting of the basin. There is insufficient data however to determine whether the differences in selenium content in the sediment are related to natural background concentrations in the soils underlying the basins or are associated with the selenium levels in the evaporation basin water. Further monitoring of sediment concentrations will be needed to determine if the selenium or other trace element concentrations in the sediments in the basins will

eventually exceed established hazardous waste levels as established in the California Code of Regulations (CCR).

Considerable difficulty was encountered in analysis of the highly concentrated samples encountered in the evaporation basins. Because of the specialized laboratory procedures needed, it is recommended that Regional Board staff continue at least an annual monitoring of each basin to ensure a reliable source of data. The pond operators however should begin monitoring for total dissolved solids and total selenium, molybdenum, boron and arsenic on a routine basis. In addition flow monitoring of basin inflows not currently being monitored should begin immediately.

I. BACKGROUND

In early 1985, the State Water Resources Control Board found the evaporation and disposal of agricultural subsurface drainage water in Kesterson Reservoir to be hazardous to the environment and ordered the site cleaned up. The principal concern was the trace element selenium which was linked to waterfowl deaths and deformities at the site; however, data presented in the hearings also showed elevated levels of chromium, copper, nickel, zinc and other trace elements in the drainage water entering Kesterson Reservoir. Concern was also expressed at the hearings that other sites within the San Joaquin Valley that were being used to store and evaporate agricultural subsurface drainage water were creating similar hazards to the environment.

At the time of the hearings, all subsurface drainage water evaporation basins were regulated under the Tulare Lake Basin Water Quality Control Plan which provided for regulation under waste discharge requirements and exemptions from waste discharge requirements if certain siting criteria and construction standards were met. The Basin Plan policy considers evaporation basins to be interim disposal measures. Continued delays in finding a valleywide drainage water disposal solution however are causing these facilities to be used as longer-term disposal options. Because of the concern expressed in the State Board Kesterson hearings that trace element buildup and impacts from selenium may be occurring in these evaporation basins, the Central Valley Regional Board directed staff to reevaluate the water quality at each site, and determine whether similar high levels of selenium were present or would occur. The Board also asked staff to begin development of the data necessary to reevaluate the present policy of considering these basins as interim facilities. This long-term policy evaluation was begun by the funding of two studies through the University of California at Davis to evaluate the physical, chemical and biological characteristics of several existing basins and use prediction techniques to estimate the characteristics of these basins in the future. This work is on-going and will be reported when completed. Since the funding of these projects, several concurrent research efforts have been initiated by the California Department of Water Resources, the University of California, the U.S. Fish and Wildlife Service and the U.S. Geological Survey. A review of these studies is given in DWR, 1988.

In the summer of 1985, a reconnaissance field survey was conducted to locate and document the present use and condition of all agricultural evaporation basins in the San Joaquin Valley that were used for disposal of subsurface drainage water. A site inspection was conducted and a water quality sample for selenium collected at selected sites. Water quality samples taken for selenium showed large variability between sites. However, all results for selenium were suspect due to inconsistent analytical results between laboratories who were working on water quality samples taken from similar sites. Because of the laboratory analytical problems, the reconnaissance survey conducted in the summer of 1985 did not allow staff to determine future regulatory needs. In addition, more definitive

information was needed on design and operation of the evaporation basins to confirm the variability in water quality found between various basins, within the cells of a single basin, and at different times of the year.

Because of the continuing concern for selenium and trace element buildup and the need to establish regulatory priorities, Regional Board staff initiated a more intensive survey to document the existing water quality in each evaporation basin. The objectives were:

- a. locate and inspect all agricultural subsurface drainage water evaporation basins within the San Joaquin Valley and document any visual waterfowl, wildlife, or other aquatic life use at the sites;
- b. document baseline water quality (including trace element concentrations) in each cell and inlet of the basins and trace element concentrations in sediment or other accumulations within the basins. This data would be used to establish priorities for regulatory programs and discharger monitoring;
- c. evaluate the need for increased regulatory work regarding Subchapter 15 of the California Code of Regulations (CCR), Title 23, Sections 2510-2601 and the Hazardous Waste Criteria found in Title 22, CCR, Section 66699 as it applies to the Toxics Pits Cleanup Act (TPCA); and
- d. identify and resolve water quality analytical problems caused by interferences from the high salt matrix in the evaporation basin water. This work would be used to establish sampling and analytical techniques to be used by dischargers in compliance monitoring.

This program was conducted in three phases. The first was an aerial surveillance of all agricultural evaporation basins conducted in the summer of 1986. The second and third phases were inspections and surveys of the basins at critical times of the year. The first survey, in December 1986, was conducted during the peak waterfowl migration and wintering period and at a time when the basins contained their lowest annual water levels and most evapoconcentrated water. The second survey, in June 1987, was conducted after the peak migration season, but in water scarcity periods for waterfowl and the period of maximum annual water levels in the evaporation basins. Follow-up inspections and confirmation sampling have been conducted at selected sites since the June 1987 survey. At all sites a visual survey of waterfowl use was conducted and water quality and sediment samples were collected. The waterfowl use data is available in the Regional Board files. This report covers the work done by staff to characterize water quality in the basins and define the present concentrations of selenium and other trace elements found in the basins. The study area and field and laboratory methods used are described in the following sections along with a discussion of existing water and sediment quality in the basins.

II. STUDY AREA

There are presently 27 separate evaporation basins in different hydrogeologic areas of the San Joaquin Valley. The location of these basins ranges from Gustine in the north to near Bakersfield in the south; the greatest concentration of basins lies along the edges of the former Tulare Lake Bed (Fig. 1). Most of the evaporation basins (23) are privately owned and serve individual farms. These twenty-three sites however make up only 55 percent of the ponded acreage. The remaining 45 percent of the ponded acreage is operated by two drainage districts. Present facilities cover a total of 7,160 acres with basin sizes ranging from 10 to 1,800 acres (Table 1). The present 27 facilities have 89 individual cells and 53 inlets which result in a large variability in water quality. An additional 10,000 to 20,000 acres of evaporation basins are in various stages of planning, development and construction in the San Joaquin Valley.

San Joaquin Valley evaporation basins consist of three types (Table 1):

- 1) In-series
multiple cells within a basin,
single or multiple inflow points from drainage collection system
increasingly concentrated water is routed to succeeding cells
last cell or cells serve as final evaporation and salt deposition site
- 2) Unicellular-wet
single-celled basin which does not evaporate to dryness
- 3) Unicellular-dry
single-celled basin which evaporates to dryness each year.

Some basins are combinations of these three types due to operation and location of the inlets to the basin.

III. FIELD SURVEYS AND DATA COLLECTION

An aerial survey was conducted in June 1986 to locate all existing evaporation basins and to document water level changes from the initial survey conducted in the summer of 1985. Aerial photographs for each site are on file with the Regional Board.

An inspection of each evaporation basin was conducted from 1-3 December 1986 and from 8-11 June 1987. Not all basins or inlets were accessible or contained water during each survey period. Waterfowl use on the date of inspection was recorded along with field measurements of water depth, water temperature, and water electrical conductivity for each cell and inlet at the evaporation basin site. Field electrical conductivity measurements were used for cell differentiation and choice of sampling site and were not recorded as field data at all sites because of the inaccuracy of the field instruments at the high salt concentrations found in the basins.

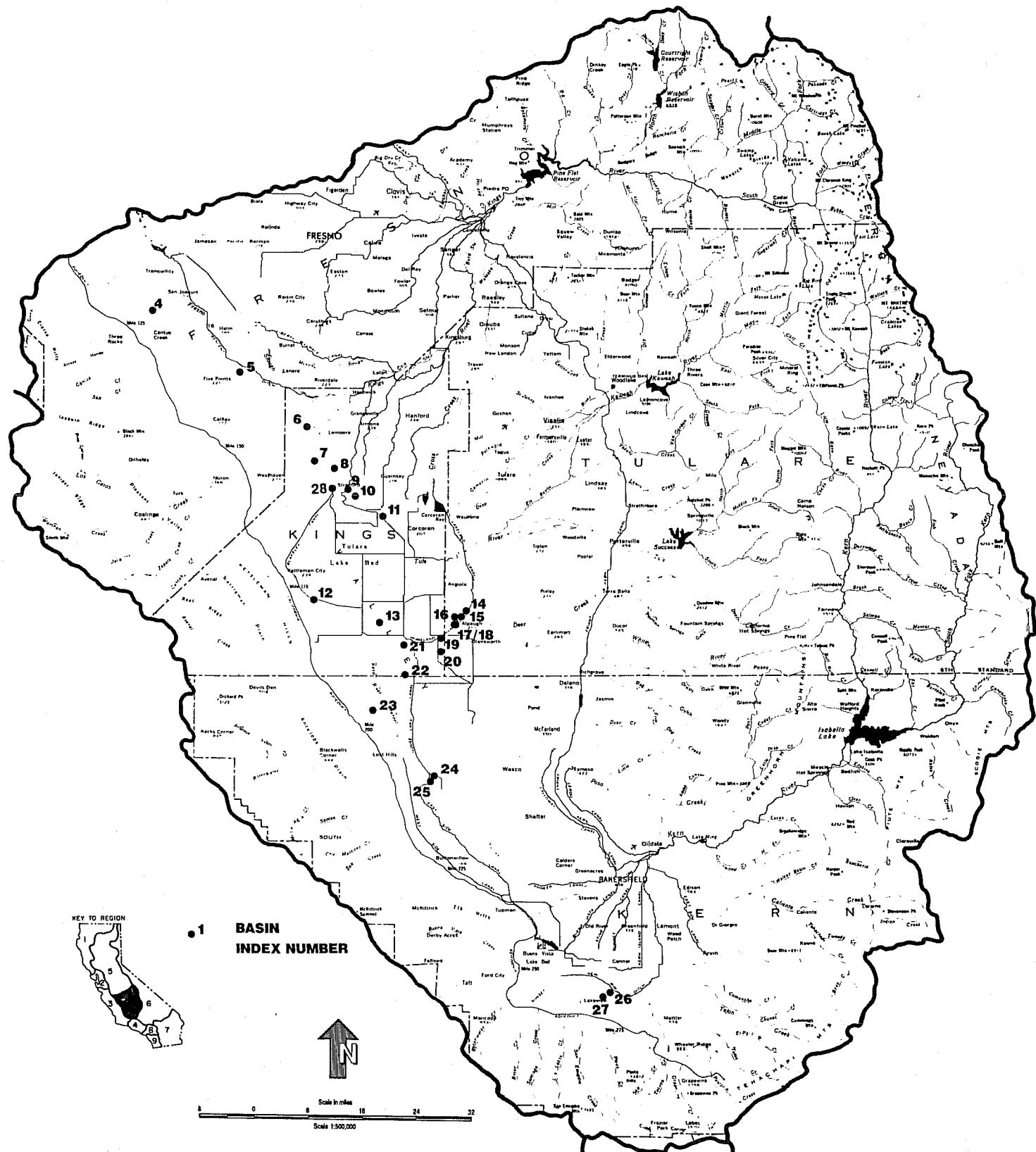


FIG. 1. LOCATION OF AGRICULTURAL EVAPORATION BASINS IN THE TULARE BASIN.

Table 1. Characteristics of Evaporation Basins Located in the San Joaquin Valley.

BASIN NUMBER (1)	BASIN NAME	COUNTY	1st YEAR OPERATION	BASIN SIZE (acres)	BASIN TYPE (2)	GEOLOGIC SETTING (3)	CELLS (4)	INLETS (5)
1	Souza	Merced	unknown	10	2	Basin	1	4
2	Lindemann	Merced	1985	100	2	Basin	1	1
3	Blitz South Dos Palos	Merced	1985	50	1	Basin	2	1
4	Summer Peck	Fresno	1984	120	1	Alluvial	6	3
5	Blitz Deavenport - Five Points	Fresno	1982	20	2	Alluvial	2	1
6	Stone Land Company	Kings	1984	200	2	Basin	3	5
7	Carlton Duty	Kings	1983	80	2	Basin	1	2
8	Westlake 1 & 2 (North)	Kings	1984	260	2	Basin	2	3
9	Meyers Ranch	Kings	1983	80	1	Basin	3	1
10	Barbizon Farms	Kings	1985	70	2	Basin	1	2
11	TLDD North	Kings	1974	265	1	Lake	7	1
12	Westlake 3 (South)	Kings	1984	740	1	Lake	6	2
13	Liberty Farms (J-W Farms)	Kings	1981	640	3	Lake	4	5
14	Pryse Farms	Tulare	1985	80	1	Lake	2	1
15	Bowman Farms	Tulare	1981	70	3	Lake	3	2
16	Morris Farms	Tulare	1985	40	3	Lake	1	1
17	Martin Farms	Tulare	1985	15	2	Lake	1	1
18	Smith Farms	Tulare	1985	10	3	Lake	1	1
19	Four - J Corporation	Kings	1985	30	3	Lake	1	2
20	Nickell	Kings	1985	20	3	Lake	1	1
21	TLDD Hacienda Ranch	Kings	1978	1100	1	Lake	8	1
22	TLDD South	Kng/Krn	1978	1800	1	Lake	11	1
23	Lost Hills (Westfarmers)	Kern	1984	790	1	Alluvial	4	3
24	Carmel Ranch (Willow Creek)	Kern	1972	300	1	Lake	6	3
25	Lost Hills Ranch	Kern	1981	100	1	Lake	3	1
26	Rainbow Ranch (Sam Andrews)	Kern	1983	105	1	Alluvial	4	2
27	Chevron Land Company	Kern	1985	65	1	Alluvial	4	2

(1) Basin number corresponds to identification numbers used in Figure 1.

(2) Basin Types are: 1) in-series; 2) unicellular-remains wet/year round; 3) unicellular

(3) Geologic Setting: Site underlain by Alluvial Fan, Basin Trough, or Lake Bed type sedimentary deposits (see text for more detail)

(4) Cells are separate evaporation units. Cells in at least 7 basins are further divided into subcells by windbreaks, levees, or multiple inlets.

The total no. of cells + subcells is 109.

(5) Multiple inlets may exist within individual cells or basins; see individual site descriptions for further details.

A water quality sample was taken from each cell or subcell within an evaporation basin during each inspection. A similar sample was taken from each inlet to the basin. All samples were taken in washed and acid rinsed plastic bottles. All sample bottles were rinsed three times with the basin water prior to sampling. Separate samples were collected for standard minerals and trace elements. All trace element samples were preserved to a pH of less than 2.0 using ultra-pure nitric acid fixation techniques. No filtration of trace element samples was done prior to fixation with acid. All trace element samples were kept at approximately the basin water temperature prior to fixation with nitric acid. This avoided mineral and trace element precipitation in these highly concentrated samples that might be caused by lower than ambient temperatures. All trace element samples were fixed with nitric acid within 6 hours of the time the actual sample was taken from the basin or inlet. A similar temperature equalization procedure was used for all standard mineral samples taken from the basins and inlets. The standard mineral samples were not filtered.

Field methods were modified during the June 1987 sampling to include an additional sample from each basin cell, subcell and inlet for mercury analysis. The mercury sample was collected in a washed and acid rinsed amber glass bottle that was rinsed three times with the basin water prior to sampling. The mercury sample was not filtered and was preserved with a potassium dichromate solution.

Samples of the top 0 - 7 cm (0 - 3 inch) of sediment were collected from each cell that contained subsurface drainage water. This layer represents the accumulations at the bottom of that cell. Samples were obtained with a plastic sampler that was rinsed several times with pond water prior to sampling. All sediment samples were placed in plastic bags and frozen until analysis. All sediment samples were analyzed for standard minerals and trace elements.

A quality control and quality assurance program was conducted. For water analysis, spike and duplicate samples were utilized in the laboratory. In addition, 10 percent blind duplicate samples were submitted to the laboratory with 50 percent of these being spiked with known concentrations. For sediment analysis, blind duplicate and spike samples were submitted. Internal standards were used in the laboratory for both water and sediment analysis. Reported results fall within quality assurance tolerance guidelines for both water and sediment analysis.

IV. RESULTS OF WATER QUALITY ANALYSES

A summary of the analyses for standard minerals and trace elements in water samples collected at evaporation basin sites by Regional Board staff for both inlet and basin cell water quality analyses are given in Tables 2 and 3, respectively. Full data sets are presented in Appendix A and B for standard minerals and trace elements, respectively. It must be recognized that the results presented here are for grab samples collected in each basin or inlet and do not

**Table 2. Levels of Selected Constituents in Inflow
to Agricultural Drainage Water Evaporation Basins
in the San Joaquin Valley, California ****

Basin	Total Dissolved Solids (mg/L)	Arsenic (ug/L)	Boron (mg/L)	Chromium (ug/L)	Molybdenum (ug/L)	Selenium (ug/L)
1 Souza	1,200	ND	2.1	3	7	3.4
2 Lindemann	ND	ND	ND	ND	ND	ND
3 Britz, South Dos Palos	2,500 - 5,200	4	7.3 - 8.1	<1	114	1.9 - 5.1
4 Sumner Peck	6,400 - 13,000	2 - 4	3.2 - 9.5	<10	40 - 83	305 - 943
5 Britz-Deavenport Five Points	11,000 - 14,000	3	23 - 30	39	325	72 - 93
6 Stone Land Co.	7,100 - 34,100	2 - 8	8.3 - 33	<10	128 - 725	0.3 - 9.1
7 Carlton Duty	47,000 - 51,300	50 - 140	26 - 47	<10 - 21	250 - 1,050	11 - 32
8 Westlake 1 & 2 (North)	10,500 - 23,000	11 - 33	7 - 13	<10	300 - 410	0.5 - 4.1
9 Meyers Ranch	4,700 - 8,200	13 - 20	2.6 - 3.5	<10	230 - 300	1.1 - 1.5
10 Barbizon Farms	6,500 - 13,000	41 - 52	3.3 - 7.1	<10	225 - 570	0.6 - 1.2
11 TLDD North	3,600 - 5,200	140 - 170	2.2 - 2.8	<10	170 - 290	1.6 - 2.1
12 Westlake 3 (South)	13,000 - 49,000	29 - 65	8.8 - 29	<10	230 - 700	3.3 - 25
13 Liberty Farms (CJ & W Farms)	8,300 - 35,000	11	5.8 - 22	<10	1,500	36 - 42
14 Pryse Farms	26,000 - 45,000	280 - 330	9.8 - 18	<10	1,730 - 1,900	10 - 13
15 Bowman Farms	9,900 - 50,500	120 - 240	4.5 - 19	<10	1,670 - 3,100	15 - 37
16 Morris Farms	17,000 - 22,000	200 - 240	9.2 - 9.9	<10	2,800 - 2,875	28 - 76
17 Martin Farms	11,000 - 14,000	220	7.6 - 8.3	<10	7,775	37
18 Smith Farms	ND	ND	ND	ND	ND	ND
19 Four - J Corp.	19,200	900	18	<10	1550	36
20 Nickell	ND	ND	ND	ND	ND	ND
21 TLDD Hacienda Ranch	6,800	130	4.3	<10	750 - 1,075	7.8 - 19
22 TLDD South	10,300 - 12,000	110 - 130	4.5 - 7.1	<10	970	12 - 19
23 Lost Hills (Westfarmers)	9,600 - 47,000	3 - 7	17 - 64	<10 - 11	430 - 1,700	76 - 650
24 Carmel Ranch (Willow Creek)	9,800 - 27,000	770 - 800	8.6 - 32	<10	2,350 - 2,500	2.1 - 4.1
25 Lost Hills Ranch	14,600	860	13	<10	2,650	3.2
26 Rainbow Ranch (Sam Andrews)	19,000 - 20,000	5	22 - 26	<10	320	205 - 350
27 Chevron Land Co.	ND	ND	ND	ND	ND	ND

** All values reported as total recoverable.

TLDD Tulare Lake Drainage District.

ND No data.

**Table 3. Levels of Selected Constituents
in Drainage Water Evaporation Basins in
the San Joaquin Valley, California ****

Basins	Total Dissolved Solids (mg/L)	Arsenic (ug/L)	Boron (mg/L)	Chromium (ug/L)	Molybdenum (ug/L)	Selenium (ug/L)
1 Souza	ND	ND	ND	ND	ND	ND
2 Lindemann	ND	ND	ND	ND	ND	ND
3 Britz, South Dos Palos	2,675 - 5,600	1 - 2	7.6 - 12	<10	150 - 250	1.4 - 6.6
4 Sumner Peck	11,000 - 43,000	2 - 5	5.9 - 34	<10	84 - 420	467 - 1,900
5 Britz-Deavenport Five Points	16,900 - 44,000	2 - 10	32 - 76	<10	310 - 650	25 - 83
6 Stone Land Co.	22,600 - 150,000	4 - 41	25 - 200	<10	304 - 2,160	0.7 - 5.8
7 Carlton Duty	170,000 - 171,000	50 - 200	110 - 180	<10	590 - 870	15 - 17
8 Westlake 1 & 2 (North)	26,700 - 40,900	<10	10.6 - 23	<10	450 - 800	0.4 - 2.9
9 Meyers Ranch	8,9000 - 25,900	2 - 8	3.4 - 11	<10	230 - 700	0.2 - 1.6
10 Barbizon Farms	16,000 - 27,000	26 - 93	10 - 14	<10	500 - 915	0.3 - 1.5
11 TLDD North	3,500 - 25,000	150 - 480	2.5 - 13	<10	164 - 780	1.1 - 2.5
12 Westlake 3 (South)	12,000 - 98,000	10 - 120	6.3 - 41	<10 - 12	250 - 850	2.9 - 15
13 Liberty Farms (J & W Farms)	190,000	16 - 17	6.2 - 120	<10 - 11	2,100 - 3,600	17 - 38
14 Pryse Farms	45,000 - 185,000	410 - 1200	20 - 75	<10	2,950 - 6400	14 - 17
15 Bowman Farms	41,000 - 68,000	60 - 80	11 - 23	<10	3,150 - 5,150	17 - 32
16 Morris Farms	54,000 - 117,000	100 - 380	25 - 68	<10	5,250 - 10,275	39 - 44
17 Martin Farms	60,000 - 78,400	240 - 700	47 - 55	<10	7,500 - 10,125	3 - 62
18 Smith Farms	ND	ND	ND	ND	ND	ND
19 Four - J Corp.	66,000	2,500	62	<10	5,600	53
20 Nickell	ND	ND	ND	ND	ND	ND
21 TLDD Hacienda Ranch	8,300 - 150,000	100 - 590	4.3 - 76	<10	910 - 5,900	7.3 - 30
22 TLDD South	13,600 - 170,000	120 - 810	9.2 - 140	<10	1,300 - 11,050	9.8 - 24
23 Lost Hills (Westfarmers)	34,300 - 120,000	9 - 18	75 - 174	<10	1,600 - 3,700	85 - 646
24 Carmel Ranch (Willow Creek)	13,600 - 388,000	360 - 13,000	17 - 840	<10	1,900 - 40,000	1.1 - 5.4
25 Lost Hills Ranch	15,300 - 72,000	820 - 2,600	12 - 35	<10	2,940 - 7,000	2.1 - 10
26 Rainbow Ranch (Sam Andrews)	27,000 - 130,000	3 - 13	42 - 260	<10	2,140 - 13,250	230 - 840
27 Chevron Land Co.	ND	ND	ND	ND	ND	ND

** All values reported as total recoverable.

TLDD Tulare Lake Drainage District.

ND No data.

reflect the daily or seasonal variability within each basin cell or inlet.

Inlets

Regional Board staff collected water quality samples from 31, 23 and 32 inlets during the summer of 1985, and during the December 1986 and June 1987 surveys, respectively. The water discharged into the basins was predominantly a sodium sulfate or sodium sulfate-chloride type water (Fig. 2) but major constituent concentrations varied widely (Table 4).

As shown in Table 4, sodium, sulfate and chloride concentrations varied widely in the influent samples from various sites. Chloride-sulfate ratios were typically less than 0.5 for inflow samples, except for certain basins in the Alpaugh area of Kings and Tulare Counties, which had chloride-sulfate ratios near 1 or greater (Appendix A). The calcium and magnesium cations and the bicarbonate anion were found in only minor amounts in the inflow samples. During the three surveys, no significant differences in major constituent concentrations were found between inlet samples collected at individual sites.

Specific conductance of the inlet samples ranged from 2,000 - 65,000 $\mu\text{mhos}/\text{cm}$ (dSm^{-1}). Total dissolved solids (TDS) values for influent samples ranged from 1,200 - 51,350 mg/L with a geometric mean of 15,300 mg/L. In comparison, the total dissolved solids concentration for seawater is approximately 31,000 mg/L with a chloride to sulfate ratio approaching 10.

Table 4. Concentration Ranges for Selected Constituents In Agricultural Subsurface Drainage Water Inlets and Evaporation Basins In the San Joaquin Valley.

Constituent (Total Recoverable)	EVAPORATION BASINS				INLETS			
	Minimum	Median	Geometric Mean	Maximum	Minimum	Median	Geometric Mean	Maximum
Na (mg/L)	470	8500	8850	138000	250	4700	3950	15000
SO ₄ (mg/L)	1400	14000	12850	95500	320	6150	6600	31400
Cl (mg/L)	220	3850	4550	171000	200	1850	1950	18000
EC ($\mu\text{mhos}/\text{cm}$)	3610	35300	32100	>200000	2000	18900	18300	65000
TDS (mg/L)	2675	33300	31850	388000	1200	17000	15300	51350
B (mg/L)	2.5	20	23	840	2.1	10	11	64
As ($\mu\text{g}/\text{L}$)	<1	33	44	13000	2	29	31	900
Mo ($\mu\text{g}/\text{L}$)	58	1002	1048	39900	7	533	510	7775
Se ($\mu\text{g}/\text{L}$)	0.2	14	17	1940	<1	10	11	943

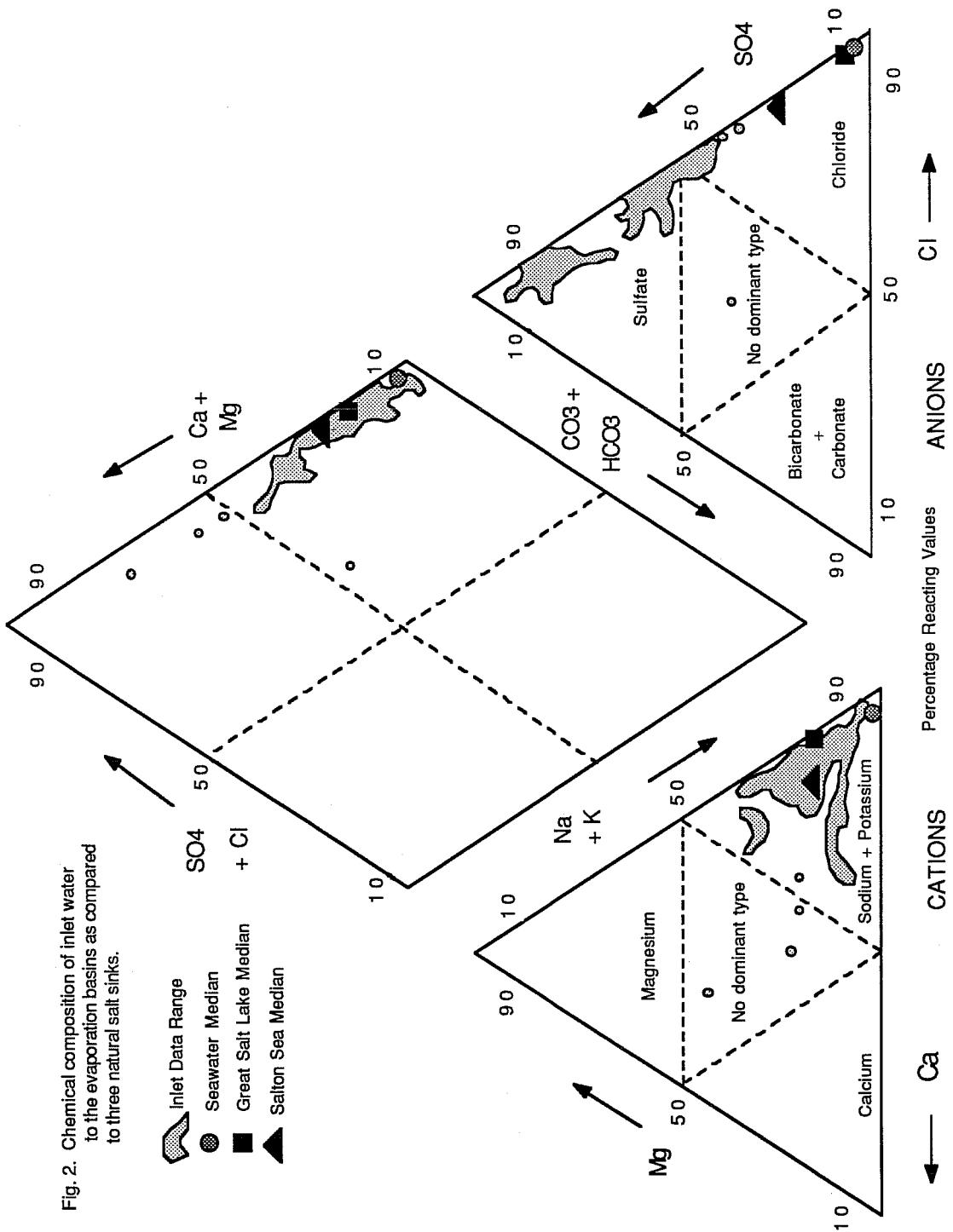


Fig. 2. Chemical composition of inlet water to the evaporation basins as compared to three natural salt sinks.

Trace element concentrations varied widely between basin inlet samples (Table 4). Selenium concentrations ranged from less than 1 to 943 ug/L. The distribution of selenium values was strongly skewed because inlets at a few basins contained relatively high selenium concentrations whereas the remaining inlets contained relatively little selenium (Fig. 3). Selenium concentrations exceeded 100 ug/L in inlets from only 3 basins. Over 50 percent of the samples collected from basin inlets had selenium concentrations less than the 10 ug/L drinking water criterion.

Like selenium, the concentration of molybdenum and arsenic varied widely between basin inlet samples (Table 4). Molybdenum concentrations in inlets samples ranged from 7 - 7,775 ug/L with a geometric mean of 510 ug/L. Only 10 percent of the inlet samples had molybdenum concentrations less than 100 ug/L (Fig. 3), and approximately 50 percent had molybdenum above 500 ug/L. Arsenic concentrations ranged from 2 to 900 ug/L with a geometric mean of 31 ug/L. Approximately 45 percent of the inlet samples collected had arsenic concentrations less than 20 ug/L (Fig. 3) and 35 percent had arsenic that exceeded 100 ug/L. In comparison, the molybdenum and arsenic concentrations in seawater are 10 and 3 ug/L, respectively while the arsenic concentration in the Great Salt Lake is 225 ug/L.

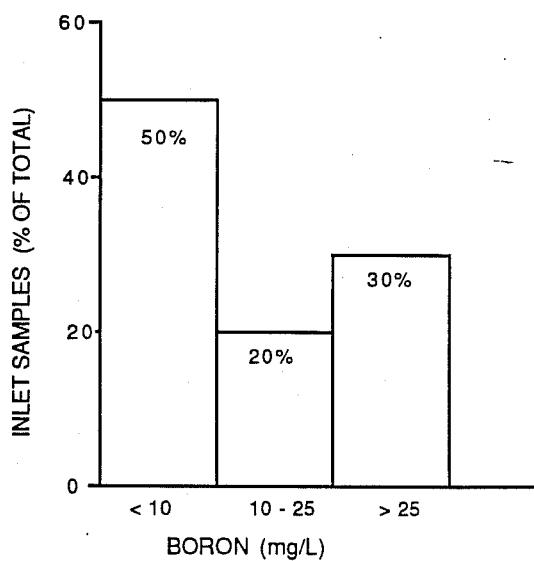
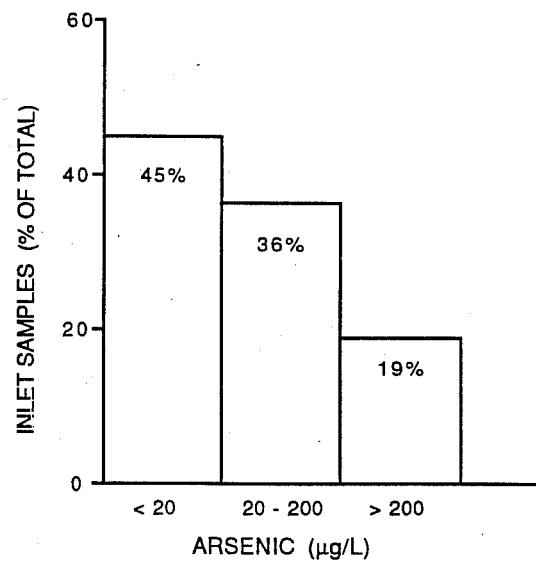
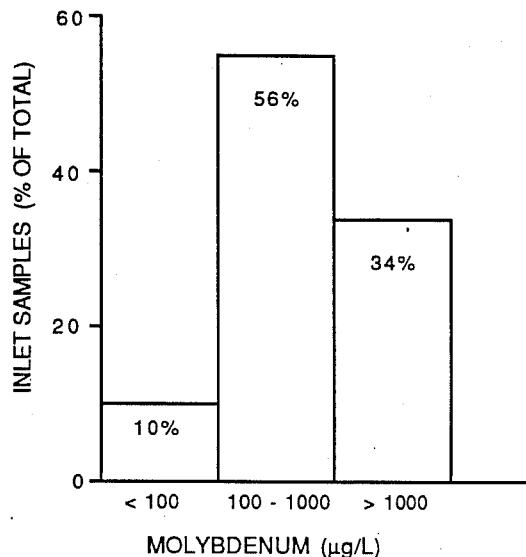
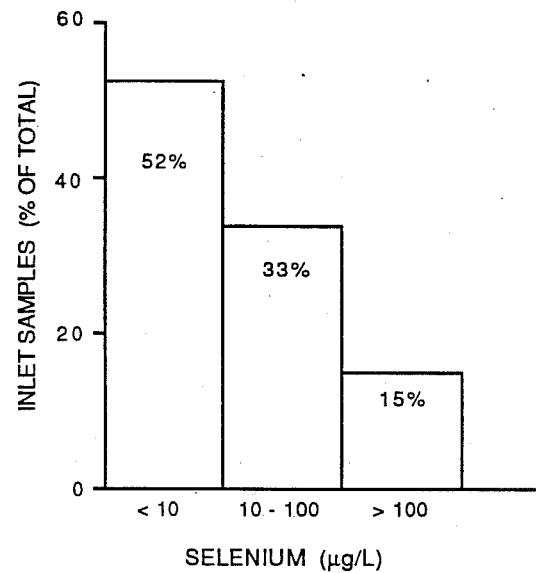
The trace element that occurs in the inlet flows in the highest concentration is boron. Boron in the inlet samples ranged from about 2 - 64 mg/L with a geometric mean of 11 mg/L and a median value of 10 mg/L. Seawater also has high boron concentrations compared to other trace elements. Seawater has 4.5 mg/L while the Salton Sea and the Great Salt Lake have water concentrations of 35 and 50 mg/L, respectively.

The concentrations of cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb), and zinc (Zn) were determined to be below currently achievable detection levels for the inlet samples. Higher than normal analytical detection levels had to be utilized due to the highly saline matrix of the drain water (see Appendix B). The available results indicate, however, that these six trace elements are present in relatively low concentrations in the inflow to the evaporation basins. Because of the difficulty experienced by many agencies in conducting analyses for low level determinations of these trace elements in highly saline water, the Regional Board is now funding a research effort to establish what these low levels are in these samples and identify analytical techniques that can be used by dischargers to monitor these elements. The results of this effort will be reported when completed. Mercury concentrations in the inflow to the evaporation basins were all below the analytical detection level of 0.2 ug/L.

Evaporation Basins

Regional Board staff collected water quality samples from 34, 84 and 100 basin cells and subcells during the summer of 1985, December 1986 and June 1987 surveys, respectively. Water collected from the basin

Fig. 3. Percentage of inlet samples showing selected selenium, molybdenum, arsenic, and boron concentrations.



cells showed sodium, sulfate and locally chloride as the major ions. As with the inlets, the water in the basins was a sodium sulfate or sodium sulfate-chloride type water (Fig. 4) but the major constituents varied widely (Table 4).

Salt concentrations found in the basin samples varied widely but were higher than the respective influent samples due to evaporative concentration of dissolved constituents. For example, the total dissolved solids (TDS) concentrations for the basin samples ranged from 2,675 - 388,000 mg/L (Table 4), the latter concentration being over 12 times that of seawater. The large variability in total dissolved solids is partly due to extensive evapoconcentration in certain basin cells, especially those basins that are operated "in-series" where final evaporation takes place in the final evaporation cells. The geometric mean for all the basin samples was approximately 32,000 mg/L TDS in comparison to 15,300 mg/L TDS for the inlet samples to these basins. Ranges and geometric means for selected cations and anions for inlet and basin samples are compared in Table 4.

Chloride-sulfate ratios were typically less than one for all basin samples except for certain basins in the Alpaugh area where ratios approached or exceeded one. A similar characteristic was found with the inlet water samples. Ratios approaching or exceeding one were also noted in the highly concentrated cells. This is likely due to selective precipitation of certain ions such as calcium and sodium sulfate as the concentration in the basin increases. Water temperature may also be a factor in selective precipitation of certain salts. The basin water temperatures ranged from a low of 47 °F during the December 1986 survey to a high of 96 °F during the June 1987 survey. The University of California, through a Federal 205(j) Clean Water Grant administered by the Central Valley Regional Water Quality Control Board is assessing the changes in salinity concentrations and chemistry that may be taking place as these facilities become more concentrated through evaporation and during temperature changes (Tanji et al., 1988).

Trace element concentrations in the basin cell and subcell samples varied widely. In general, trace element concentrations in the basin samples were higher than the levels found in the corresponding inflow samples (Table 4). Trace element data is presented in Appendix B.

Total recoverable selenium concentrations ranged from 0.2 - 1,940 ug/L with a geometric mean of 17 ug/L. This is slightly higher than the geometric mean for the inlet samples which was 11 ug/L. The distribution of high and low values were directly related to selenium concentrations found in the basin inlets. Ten of the basins had total selenium concentrations less than 10 ug/L which represents 30 percent of the surface acreage of the existing evaporation basins. Only 3 basins, accounting for 15 percent of the total surface acreage had total selenium concentrations that exceeded 100 ug/L (Fig. 5). Of the remaining 11 basins sampled which total 55 percent of the surface

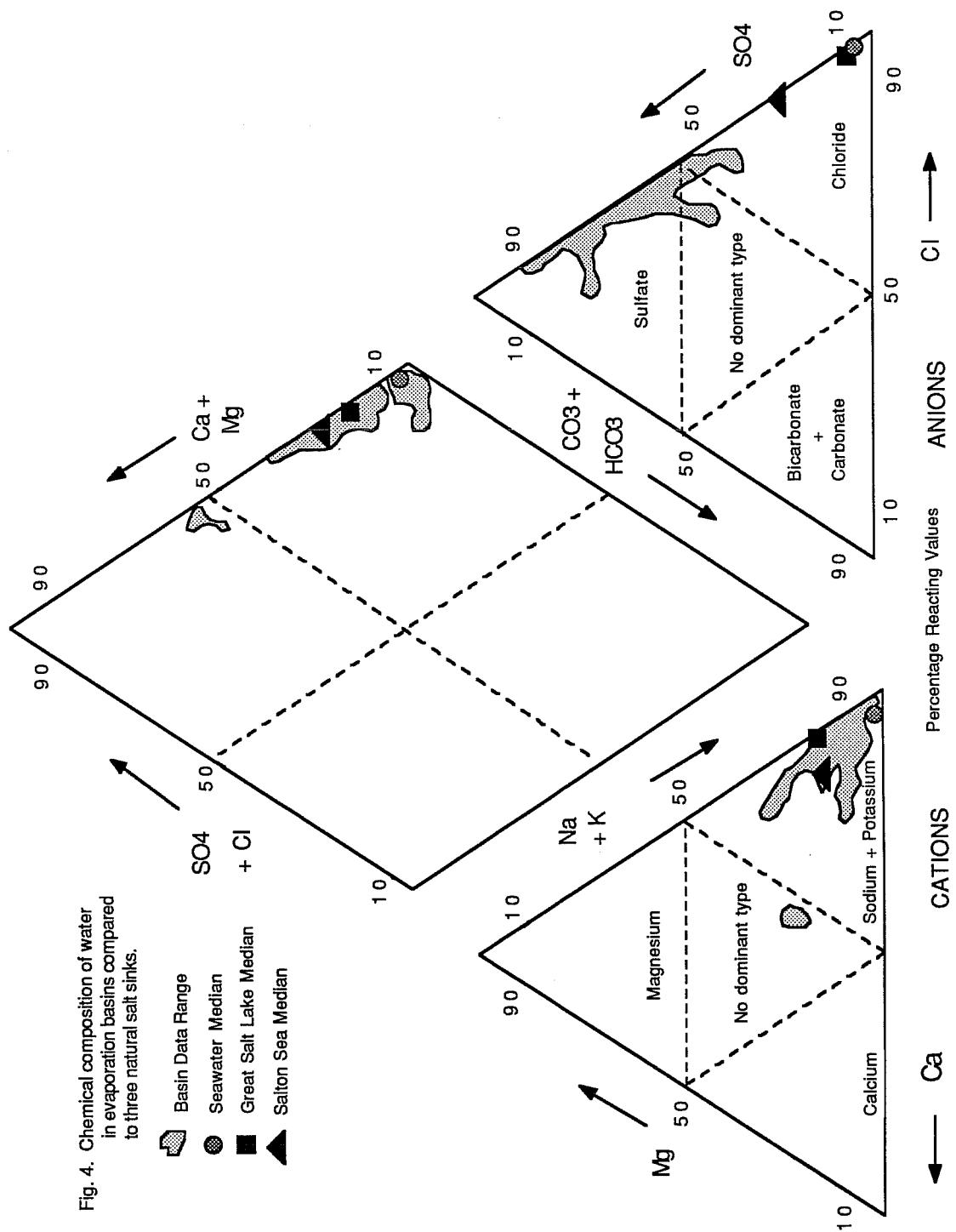
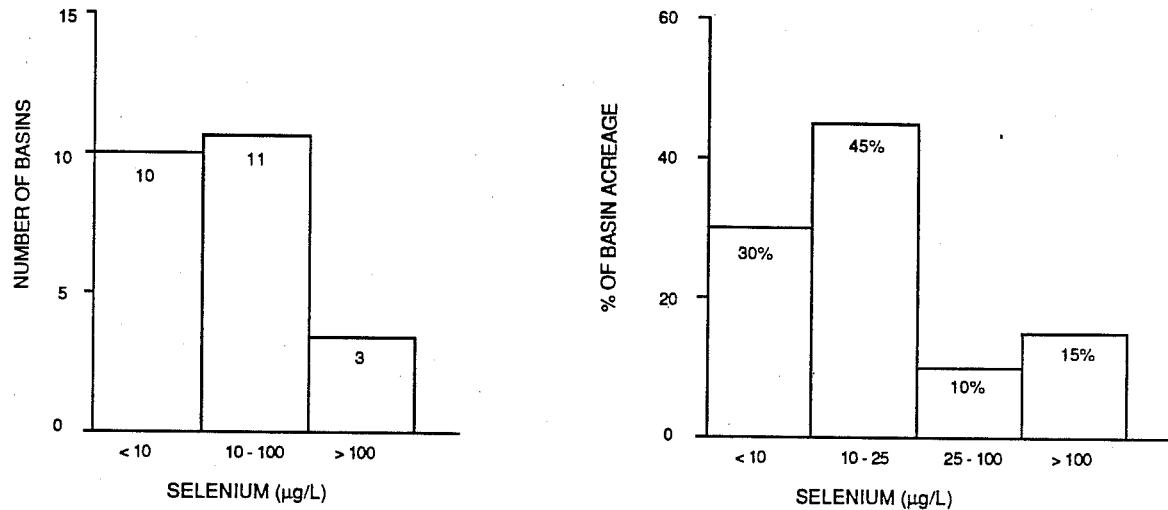


Fig. 5. Selenium concentrations found in evaporation basins for which data is available and the percentage of the total basin acreage showing selected selenium concentrations.

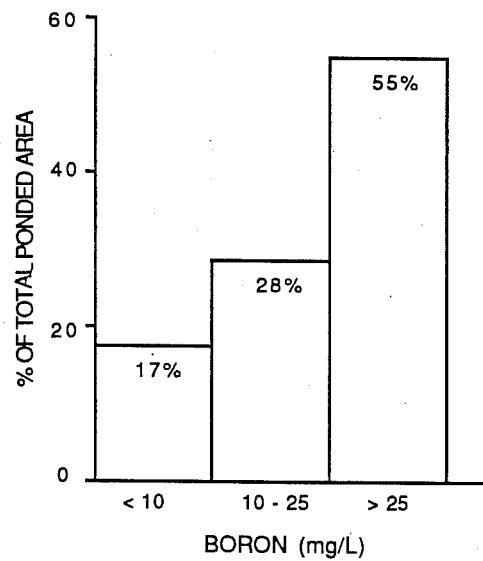
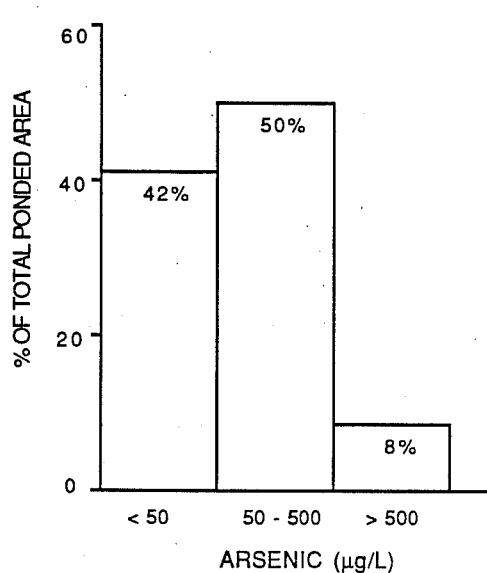
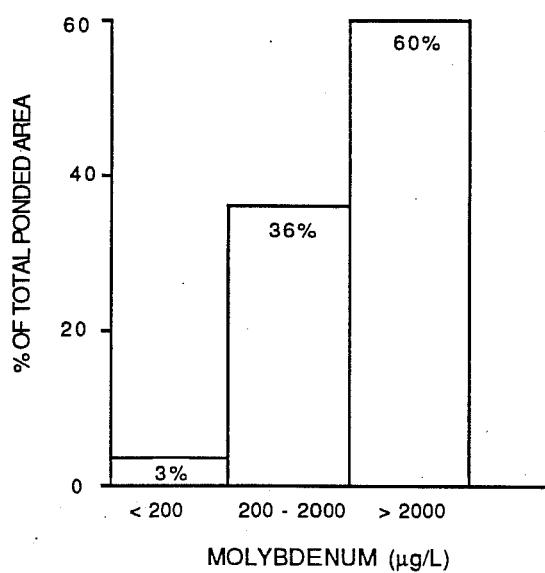


acreage, most have selenium concentrations between 10 and 50 $\mu\text{g/L}$ with over 80 percent of this acreage having water concentrations between 10-25 $\mu\text{g/L}$ total selenium.

Molybdenum concentrations in water samples collected from the evaporation basin cells varied from 58 - 39,900 $\mu\text{g/L}$ with a geometric mean of 1,050 $\mu\text{g/L}$. Molybdenum concentration in the basin cells were generally high with greater than 60 percent of the water surface acreage in the basin cells showing molybdenum concentrations in excess of 2,000 $\mu\text{g/L}$ (Fig. 6). Arsenic concentrations varied from less than 1 $\mu\text{g/L}$ to 13,000 $\mu\text{g/L}$ with a geometric mean of 44 $\mu\text{g/L}$. Over 90 percent of the basin acreage had arsenic concentrations less than 500 $\mu\text{g/L}$ and only 17 percent of the basin acreage exceeded the 225 $\mu\text{g/L}$ level which is the approximate arsenic concentration of the Great Salt Lake in Utah. These higher concentrations were generally associated with the final concentration cells in basins that are being operated "in-series".

As with the inlets, the trace element that occurs in the basins in the highest concentration is boron. Water concentrations of boron in the basin cells ranged from 2.5 to 840 mg/L with a geometric mean of 23 mg/L. This is approximately twice the geometric mean for the inlets of 11 mg/L (Table 4). Boron concentrations exceeding 45 mg/L (10X seawater concentration) occurred in approximately 40 percent of the

Fig. 6. Percentage of total ponded acreage exceeding selected concentrations of molybdenum, arsenic and boron.



ponded acreage. Less than 20 percent of the ponded acreage has boron concentrations less than 10 mg/L, the median value for the inlet water.

The general trend of increased concentration with continued evaporation can be observed in the trace element data for evaporation basins operated "in-series". Boron, arsenic, molybdenum, and selenium generally display a linear increase in concentration with increasing salinity, measured as total dissolved solids (Fig. 7 and 8). Where a constituent is present in relatively low amounts, such as selenium in Basins 11, 21, and 22 (Fig. 7d) or arsenic in Basin 4 (Fig. 8a), this trend is not evident. The lack of correlation between total dissolved solids and selenium or arsenic for these basins may be due in part to analytical uncertainty at these lower trace element concentrations. Additional investigation is needed to determine if there are any natural biological or physical-chemical processes occurring which tend to reduce the dissolved concentrations of certain elements in the basin water.

Total concentrations of cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb), and zinc (Zn) were determined for each basin water sample. It was difficult to quantify the concentration of these elements because higher than normal levels of analytical detection had to be utilized due to the highly saline matrix of the basin cell water. The available results indicate that these six trace elements if present, are present in concentrations below the detection levels used (Appendix B). As previously noted, efforts are presently underway to quantify the low levels.

Mercury concentrations in the basin water were all below the detection level of 0.2 ug/L with the exception of Basins 9, 21 and 26 which each showed very low mercury concentrations at or slightly above the analytical detection level of 0.2 ug/L. However, mercury was not detected in the inflow to these basins. Follow-up sampling will be needed to determine if these are actual concentrations.

V. GEOLOGY AND EVAPORATION BASIN WATER QUALITY

Because of the wide chemical variation found between inflows to the evaporation basins, a preliminary assessment was made of the geologic setting of the basins and its relationship to the trace element content of subsurface drainage water entering the basins. The effect of geologic setting on shallow ground water composition within a portion of the western San Joaquin Valley was previously investigated by Deveral and others (1984) and Deveral and Millard (1986). In the Deveral and Millard study, selenium concentrations were significantly higher in the ground water of the alluvial fan areas than in areas underlain by lake bed and flood basin deposits. Molybdenum and boron tended to be higher in the basin trough, but statistically significant differences in the abundances of these elements were not reported. Although most of the evaporation basins and inlets sampled for this study lie outside of the study area of Deveral and co-workers, similar correlations between geologic settings and trace element

Figure 7: Total dissolved solids versus arsenic, boron, molybdenum, and selenium for Evaporation Basins 11, 21, and 22 in 1987.

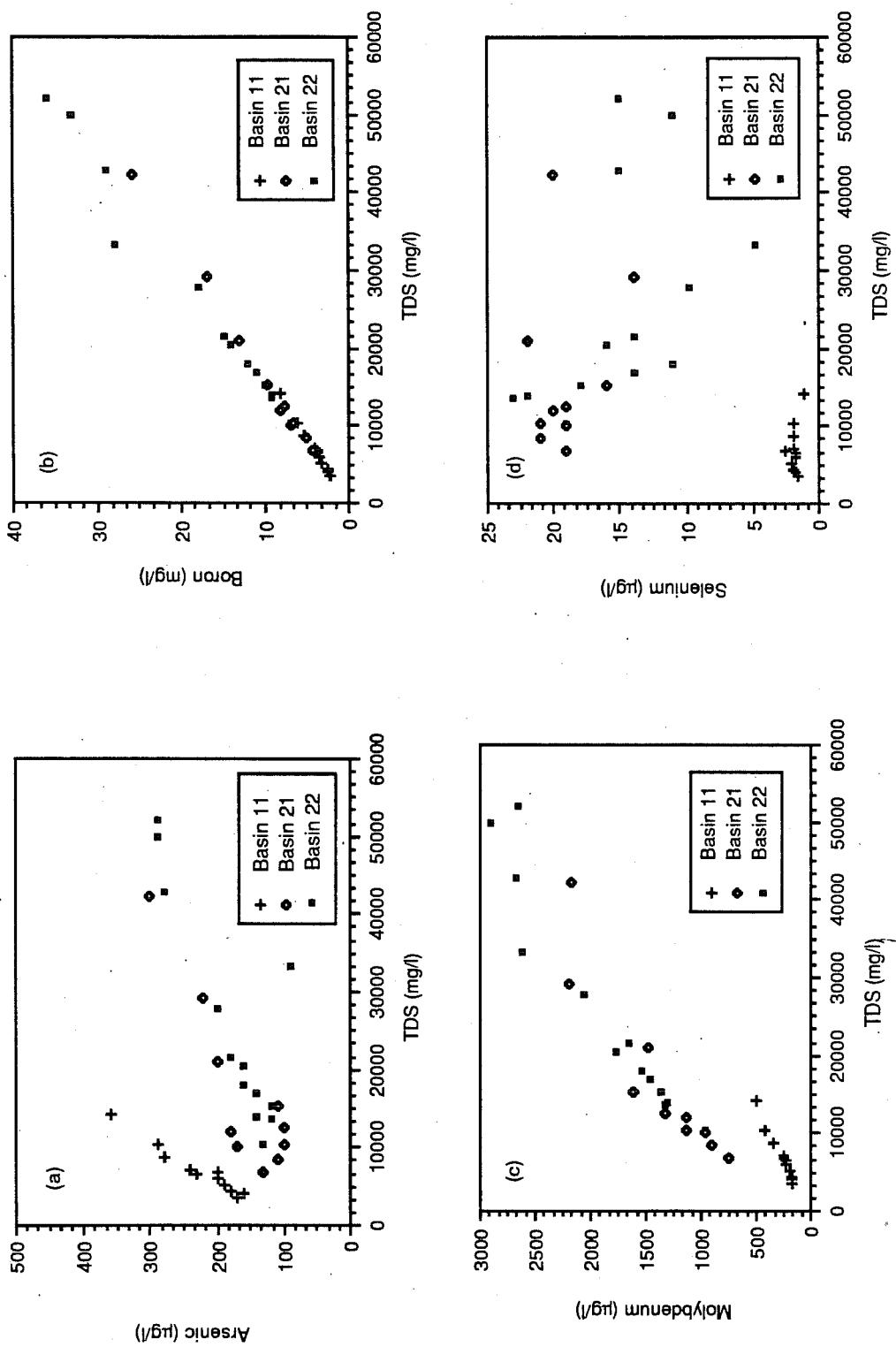
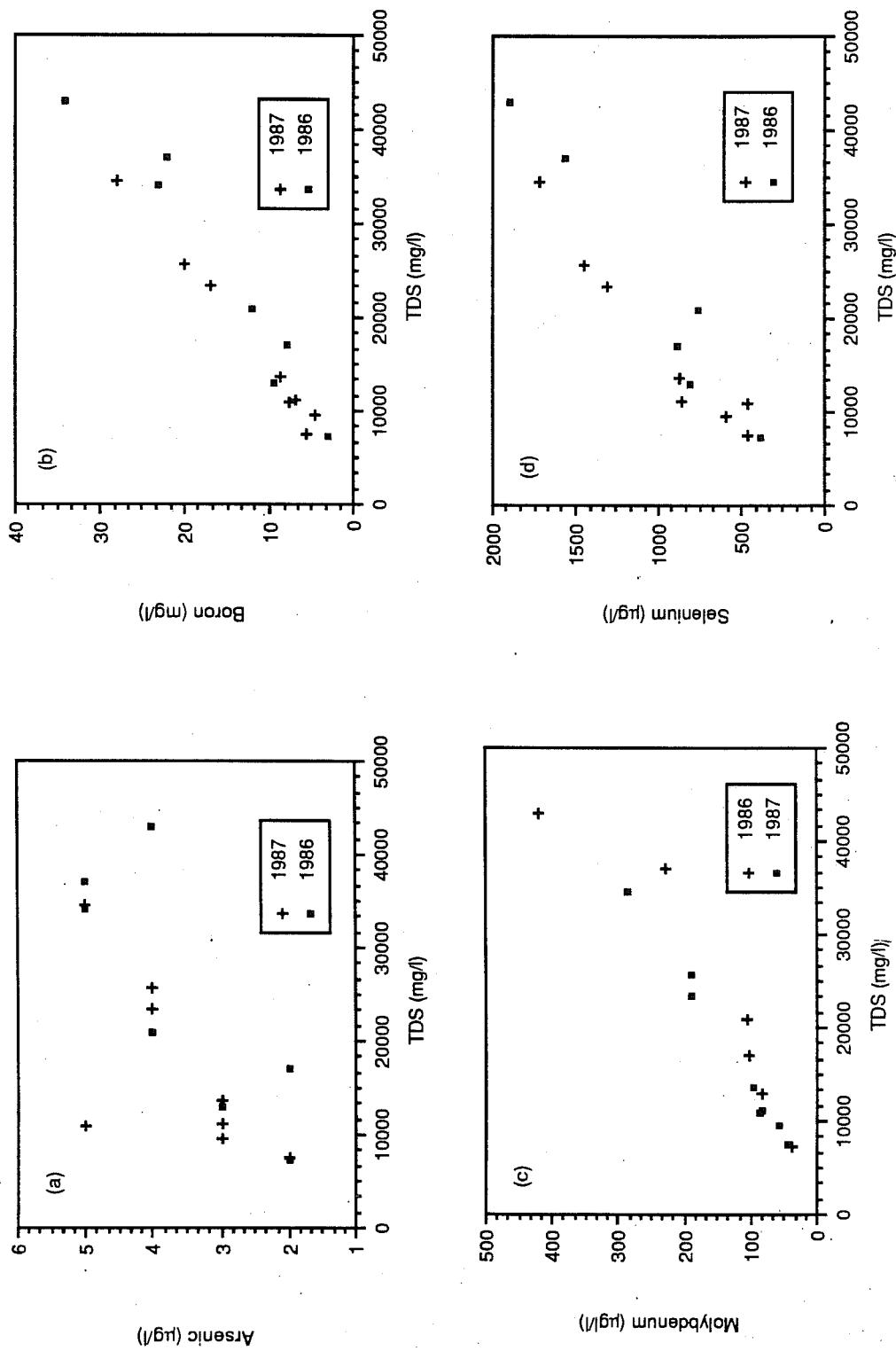


Figure 8: Total dissolved solids versus arsenic, boron, molybdenum, and selenium for Evaporation Basin 4 in 1986 and 1987.



concentrations in the drain water that enters the evaporation basins were investigated.

Subsurface drain systems that are discharged into the evaporation basins in the San Joaquin Valley drain soils derived primarily from three different geologic units (Fig. 9). As described by Page (1986) and Croft (1972), these units are:

- a) lacustrine and marsh deposits of Tertiary to Holocene age which underlie the ancient lake bed areas (now farmland) of the lower San Joaquin Valley. The lacustrine and marsh deposits consist chiefly of clay and silt and underlie the Tulare, Goose, Buena Vista and Kern Lake Beds. These deposits are of mixed Coast Range and Sierra Nevada origin;
- b) continental alluvial deposits of Tertiary to Holocene age which include a heterogeneous mix of generally poorly sorted clay, silt, sand, and gravel commonly deposited in alluvial fans. In the present study area, these alluvial fans are located along the western flank and southern end of the San Joaquin Valley and originated in the Coast Range.
- c) flood-basin deposits of Holocene age which crop out in low-lying areas in the basin (valley) trough. They result from flood waters entering low-lying basins and depositing mostly fine silt and clay and some fine sand derived from both the Coast Range and the Sierra Nevada. These deposits interfinger with and/or grade into the lacustrine and marsh deposits and the alluvial fan deposits.

Table 5 presents a summary of the total dissolved solids and selected trace element contents of evaporation basin inflow water on the basis of the geologic settings of the basins. The evaporation basins located in the alluvial fan areas contained the highest selenium concentrations in the inflow streams. The geometric mean selenium concentration was 300 ug/L as compared to 2 and 12 ug/L for those basins located on basin-trough and lake-bed deposits, respectively. Basin 5 near Five Points, had the lowest inflow concentrations within the alluvial fan group (72 - 93 ug/L). This basin is located near the contact between the alluvial and basin-trough zones and may be influenced by both geologic conditions.

The lowest selenium concentrations were found in the inflow to the evaporation basins located on the basin-trough deposits. Evaporation basins located on the lake bed deposits generally had selenium concentrations intermediate to the other two geologic settings. The concentrations in these basin inlets showed a wider variability than those on the basin trough. The concentrations in the evaporation basin cells also showed similar trends depending upon the inflow concentration.

Molybdenum and arsenic concentrations in the inlet samples both showed a strong relationship to the geologic setting. Both showed the highest concentrations in inflow samples for basins located on

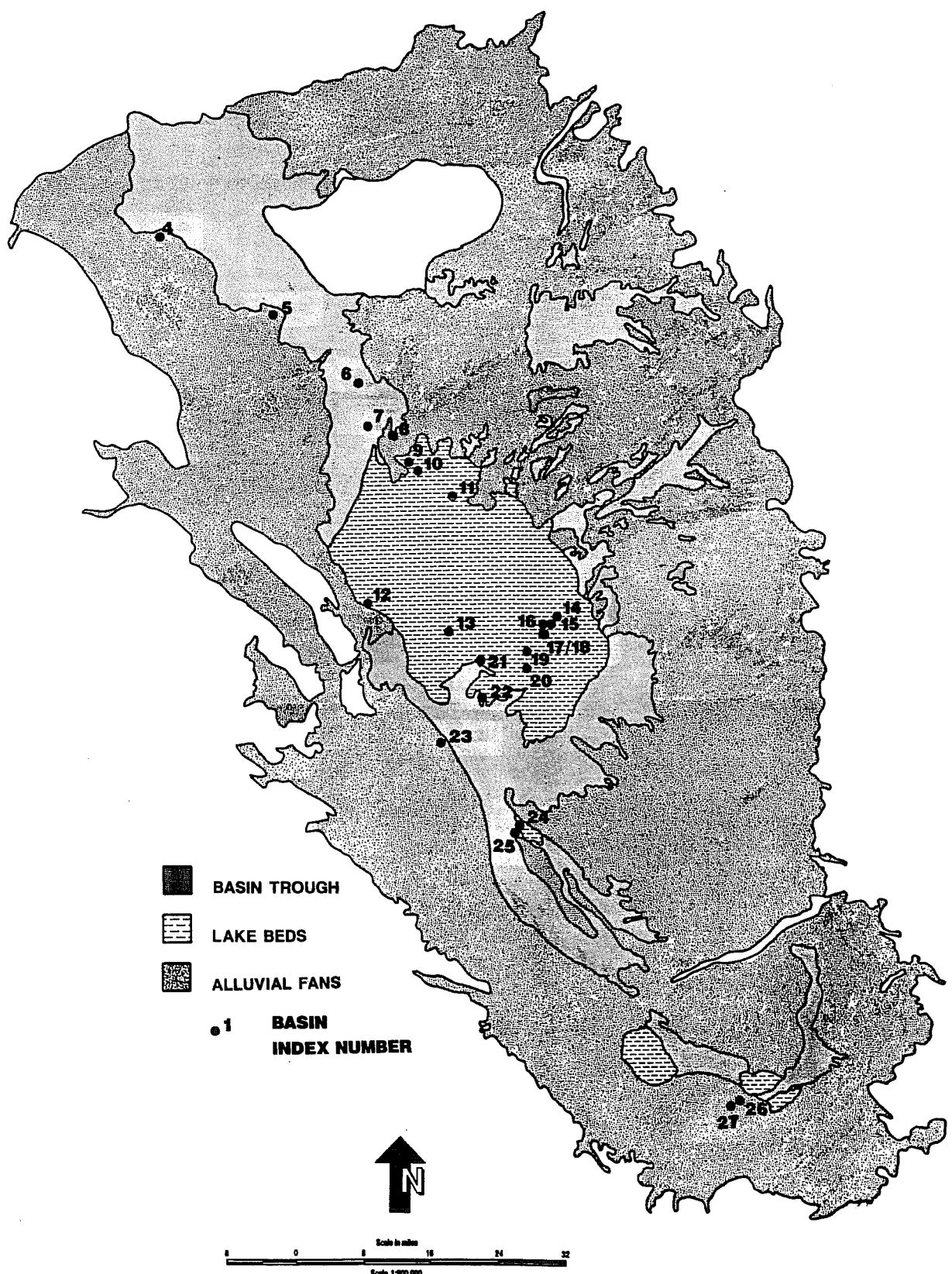


FIG. 9. LOCATION OF AGRICULTURAL EVAPORATION BASINS IN GEOLOGIC SETTINGS OF THE TULARE BASIN.

Table 5. Selected Trace Element and Total Dissolved Solids Concentrations for Inlet Flow, Evaporation Basins and Evaporation Basin Sediment as Influenced by Geologic Setting within the San Joaquin Valley.*

GEOLOGIC SETTING	INLET DATA					
	TDS - geometric mean, mg/L - (range)	B	As	Se - geometric mean, µg/L - (range)	Mo	Mn
Alluvial Fan	10,000 (1,150 - 46,400)	14 (3.2 - 64)	3.5 (2 - 7)	300 (72 - 943)	200 (40 - 1,665)	<10 (<10 - 12)
Basin Trough	12,600 (1,200 - 51,350)	11 (2.1 - 47)	10 (2 - 52)	2 (<1 - 32)	320 (7 - 1,050)	176 (<10 - 1,600)
Lake Bed	16,500 (3,450 - 47,550)	9.9 (2.2 - 32)	160 (11 - 900)	12 (1.6 - 76)	1,240 (169 - 7775)	225 (17 - 2,830)

GEOLOGIC SETTING	EVAPORATION BASIN DATA					
	TDS - geometric mean, mg/L - (range)	B	As	Se - geometric mean, µg/L - (range)	Mo	
Alluvial Fan	27,300 (10,800 - 130,000)	46 (5.9 - 260)	7 (<1 - 18)	330 (2.1 - 1,940)	840 (58 - 13,250)	
Basin Trough	25,000 (1,800 - 163,500)	21 (3.4 - 200)	30 (<1 - 2,300)	2 (0.2 - 10)	610 (150 - 2,165)	
Lake Bed	27,900 (4,200 - 388,000)	18 (2.5 - 840)	175 (10 - 13000)	8 (1.1 - 62)	1,435 (165 - 39900)	

SELECTED SEDIMENT TRACE ELEMENT DATA

GEOLOGIC SETTING	As	Se	Mo
	geometric mean, mg/kg		
Alluvial Fan	7.4	3.8	1.8
Basin Trough	4.3	0.5	3.7
Lake Bed	13.9	0.9	12.6

* All water values reported as total recoverable while sediment values reported on a dry-weight basis

lake-bed deposits. The geometric mean for molybdenum and arsenic in the inflow to basins located on lake bed deposits were 1,240 and 160 ug/L, respectively. Consistently high arsenic concentrations were associated with inflow samples for evaporation basins in the southern half of the Tulare Lake Bed including basins located in the Alpaugh area(Basins 14-17). The highest molybdenum and arsenic concentrations were associated with Basins 24 and 25 located in the Goose Lake Bed Area. Basin 26, located near the southern end of the Kern Lake Bed, is distinct as the inflow contains both high selenium and high molybdenum concentrations, both of which have been associated with different geologic settings. The basin however is located on the distal portions of an alluvial fan derived from the Wheeler Ridge area. This trace element association may be due to the location of this basin near the interface between two geologic settings. Arsenic concentrations in inflow to this site as well as to all basins located on the alluvial fan areas are low, generally less than 5 ug/L.

Boron and total dissolved solids concentrations for the inflow to the evaporation basins did not show strong differences between different geologic settings. Mercury did not appear above the detection level of 0.2 ug/L in any of the inflow samples taken from basins on the different geologic settings. There was not sufficient data to draw any conclusions with regard to the concentrations of cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb) and zinc (Zn) in inflow samples and the geologic setting of the basin.

VI. RESULTS OF SEDIMENT CHEMISTRY DATA COLLECTION

Sediment samples were collected as a composite from the 0 to 7 cm (0 to 3 inch) layer for each evaporation cell that contained or had contained subsurface drainage water. Most cells contained several layers within this 0 to 7 cm depth including an organic muck layer. This organic-rich layer was often in an anaerobic condition or caused the sediments immediately under this layer to be anaerobic. This organic-rich layer was included as part of the bottom accumulations samples. Each sample was analyzed for 13 trace elements including selenium, arsenic and molybdenum. All data are reported on a dry-weight basis. Trace element concentrations in sediments from the evaporation basins are presented in Appendix C.

Selenium concentrations in the basin sediment ranged from 0.01 - 39.8 mg/kg. Although there was wide variability between basins there appears to be a relationship between sediment selenium concentrations and the geologic setting of the basin. For example, basins in the alluvial fan areas, basin trough and lake bed sedimentary deposits showed geometric mean selenium concentrations of 3.8, 0.5 and 0.9 mg/kg, respectively (Table 5). There is insufficient data however to determine whether the differences are significant and whether they are related to natural background concentrations in the soils or the selenium levels in the drain water in the evaporation basin. No background data was available for the sites.

A similar relationship to geologic setting appears to exist for molybdenum. The geometric mean concentration for molybdenum in sediment from basins in the alluvial fan, basin trough and lake bed deposits are 1.8, 3.7 and 12.6 mg/kg, respectively (Table 5). As with selenium, the highest mean values for molybdenum appear in sediment from basins located in geological settings with the highest concentration of molybdenum in the basin water. Again there is insufficient data to determine if the difference is related to natural background concentrations in sediment or to concentrations of molybdenum in the basin water.

The arsenic levels in sediment, however did not show an association with geologic setting and basin water concentrations (Table 5). The geometric mean arsenic concentrations in sediment from the alluvial fan, basin trough and lake bed deposits are 7.4, 4.3 and 13.9 mg/kg respectively while the geometric mean water concentration for basins located on these three geologic settings are 7, 30 and 175 ug/L, respectively. Additional data would be needed to identify any significant differences for sediment samples between geologic settings and natural background concentrations or water quality in the basins.

No determinations were made for boron or total dissolved solids in sediment. Total organic carbon was determined on a selected number of samples. Data was insufficient however to determine if a relationship exists between the trace element concentrations determined and total organic carbon content. Further analysis for total organic carbon in other samples collected from the basins is underway. In addition to the composite samples reported here, cross-sectional sampling across selected evaporation basins and core sampling have been conducted. Analysis of the cross section samples and specific depths in the core samples is in progress. The core samples will be used to determine whether differences in trace element concentrations exist in the various layers found in the bottom of the cells, especially the importance of the organic muck layer which forms at various depths in the basin bottom sediments. Results from this work will assist in determining the importance of sampling depth for obtaining a representative sample.

VII. EVAPORATION BASIN WATER QUALITY AND SEDIMENT DATA IN RELATION TO EXISTING WATER QUALITY REGULATIONS

Initial regulation of agricultural evaporation basins was conducted through design standards, including maximum seepage rates as specified in the Tulare Lake Basin Plan(5D). Recent changes in regulations have required increased regulatory assessment as specified in the water quality regulations for Subchapter 15, California Code of Regulations (CCR), Title 23, Sections 2510-2601 and the Hazardous Waste Criteria found in Title 22, CCR, Section 66699 as they apply to implementation of the Toxics Pits Cleanup Act (TPCA). Selected hazardous waste criteria from Title 22, CCR are shown in Table 6 along with examples of designated waste levels for Subchapter 15 evaluations for a hypothetical "average" site as specified in Marshack (1986). The

Table 6. Hazardous Waste Threshold Limit and Designated Waste Level Examples for Subchapter 15 Regulation.

Constituent	Hazardous Waste Threshold Limit Concentrations (DHS)*		Designated Waste Levels for Subchapter 15 Regulation**	
	Soluble Liquid	Solid	Soluble Liquid	Solid
Arsenic (As)	5 mg/L	500 mg/kg	220 ng/L	22 µg/kg
Boron (B)			70 mg/L	7 g/kg
Cadmium (Cd)	1 mg/L		1.0 mg/L	100 mg/kg
Chloride (Cl)			10.6 g/L	
Chromium III (Cr)	560 mg/L	2.5 g/kg	> 560 mg/L	> 2.5 g/kg
Copper (Cu)	25 mg/L	2.5 g/kg	200 mg/L	20 g/kg
Lead (Pb)	5.0 mg/L	1.0 g/kg	5.0 mg/L	500 mg/kg
Mercury (Hg)	200 µg/L	20 mg/kg	200 µg/L	20 mg/kg
Molybdenum (Mo)	350 mg/L	3.5 g/kg		
Nickel (Ni)	20 mg/L	2.0 g/kg	1.34 mg/L	134 mg/kg
Selenium (Se)	1.0 mg/L	100 mg/kg	1.0 mg/L	100 mg/kg
Specific Conductivity (EC)			70 mmhos/cm	
Sulfate (SO ₄)			25 g/L	
Total Dissolved Solids (TDS)			45 g/L	
Vanadium (V)	24 mg/L	2.4 g/kg	2.0 g/L	
Zinc (Zn)	250 mg/L	5.0 g/kg		200 g/kg

* as specified in the Hazardous Waste Criteria found in Title 22, California Code of Regulations (CCR), Section 66699.

** as specified in Table II-4, The Designated Level Methodology for Waste Classification and Cleanup Level Determination (Marshack, 1986). The levels given are for typical waste management levels found to be harmful but site specific characteristics may change these.

following discussion compares existing basin and inflow water quality with these hazardous and designated waste levels.

Hazardous Waste Criteria

Comparison of the water quality analytical results from the evaporation basins and inflow to the hazardous waste criteria of Title 22, CCR indicate that selenium and arsenic are the elements of major concern. Both selenium and arsenic exceed the hazardous waste criteria in at least 1 evaporation cell each, however the concentrations determined in this study are for total concentrations while the hazardous waste criteria is set for a soluble limit. No data is available on soluble levels. However for purposes of discussion here the total concentrations are assumed equal to the soluble levels. Prior to final determinations, soluble samples will need to be taken.

Selenium concentrations were found as high 1,940 ug/L in Basin 4, thus exceeding the 1,000 ug/L limit shown in Table 6. Two other basin sites have selenium concentrations which are above 150 ug/L. Although this level in these two basins is elevated, it is far below the hazardous waste level. The arsenic concentration in one cell in Basin 24 was found to be 13,000 ug/L which is above the 5,000 ug/L hazardous limit for arsenic as shown in Table 6. Subsequent sampling of this basin showed that arsenic concentrations fluctuate widely depending on the time of the year. A recent sample taken from the same cell shows an arsenic concentration of 3,000 ug/L for total arsenic and 2,800 ug/L for dissolved arsenic. Both of these concentrations are below the hazardous waste criteria that is used to assess the implementation of TPCA. Basins 14, 19 and 25, overlying the lake-bed deposits, also show elevated levels of arsenic (>1,000 ug/L). However, none of these facilities have exceeded the hazardous waste limits. The total acreage of the evaporation cells that contain concentrations which exceed the hazardous waste limits for either selenium or arsenic is 130 acres which represents 2 percent of the total ponded acreage presently in evaporation basins.

Molybdenum and boron both occurred at elevated levels in selected evaporation basins but at all sites the molybdenum concentrations were less than 10 percent of the hazardous waste limit. There are no hazardous waste limits for boron or total dissolved solids.

The trace elements cadmium, chromium, copper, nickel, lead, and zinc were not quantified in most of the water samples. The few values that were determined above the detection limits, the use of spiked sample concentrations above the detection limits, and the use of detection limits orders of magnitude less than the hazardous waste limits demonstrates that these six elements are present in relatively low concentrations compared to their respective hazardous waste limits.

In no instance did sediment concentrations for the 13 trace elements examined exceed the hazardous waste criteria for solids of Title 22, CCR. The data reported in Appendix C are on a dry-weight basis while

the CCR hazardous waste criteria are based on wet-weight. The moisture content of the sediment samples taken from the basins is between 50-80 percent thus the values presented in Appendix C are conservative estimates of compliance with the hazardous waste limits. For selenium on a dry-weight basis, concentrations ranged from 0.01 - 39.8 mg/kg with over 70 percent of the samples showing values below 2 mg/kg. The hazardous waste criteria for selenium (Table 6) is 100 mg/kg on a wet-weight basis. For arsenic on a dry-weight basis, concentrations ranged from 1.7 - 80.5 mg/kg with 60 percent of the samples collected having values below 10 mg/kg. The hazardous waste limit (Table 6) for arsenic is 500 mg/kg on a wet-weight basis. Molybdenum concentrations on a dry-weight basis ranged from 1 to 435 mg/kg with over 80 percent of the samples collected having values below 35 mg/kg. The hazardous waste limit (Table 6) for molybdenum in sediment is 3,500 mg/kg on a wet-weight basis.

In Basins 4 and 24, where hazardous waste limits for selenium and arsenic, respectively, have been exceeded in the basin water, the sediment concentrations for both arsenic and selenium do not exceed 10 percent of the hazardous waste limit even when reported on the conservative dry-weight basis. The water samples from Basins 4 and 24 that exceeded the hazardous waste criteria were taken from the final evaporation cells in basins that were operated "in series". The elevated levels of arsenic and selenium that approach or exceed the hazardous waste limit in the water of the final evaporation cell reflect that evapoconcentration will likely show such high concentrations in a limited amount of water which is in its final stages of concentration prior to going to dryness. In the case of the high arsenic level in a cell of Basin 24, the June 1987 water sample was taken from about six inches of water that covered about 30 percent of the cell bottom; the remainder of the cell was covered by about four to six inches of salt crust. The owner of this basin reported that this cell had not been used for over 1 year and the water in the cell was winter rainwater that had redissolved the salt crust in the basin. A confirmation sample for total arsenic was taken in the same cell under similar conditions where the majority of the cell was covered with crystalized salt with a limited amount of water remaining in the evaporation cell. This sample however only showed 5,600 ug/L total arsenic, less than one-half the original concentration. An additional sample taken from this same site only 4 weeks later showed 3,000 ug/L for total arsenic and 2,800 ug/L for dissolved arsenic. Both concentrations were below the CCR hazardous waste criteria. The salt concentration during the June 1987 sampling in the basin cell water was approximately 12 times that of seawater. Salt concentration data is not available for the other two samples.

As discussed earlier, in the case of both the basin with elevated arsenic and the basin with elevated selenium, the concentrations of arsenic and selenium in the sediments are only slightly elevated and are an order of magnitude below the concentrations defined as the hazardous waste limit. These levels ease the concern for the short-term buildup of arsenic and selenium in the sediments at these sites. However, further testing is needed to determine if the

crystallized salt remaining in the basin contains elevated trace element concentrations.

The evaporation process at sites similar to these will likely build up concentrations of certain trace elements in water to near or above the existing hazardous waste criteria for short periods of time as illustrated in the data collected for Basins 4 and 24. These high concentrations however will be in a significantly reduced water volume. Data presently available shows that evapoconcentration will be the major factor in the buildup of the constituents as existing monitoring does not show hazardous concentrations entering the basins with the inflow and monitoring to date does not show these constituents to be building up in sediments to concentrations considered hazardous under the present list in Title 22, CCR(Table 6). Hazardous levels in the basins therefore are likely to be transitory in nature and only occur in a limited volume of water for a short period of time.

Designated Waste Levels

Selected designated waste levels are also shown in Table 6. The definition of designated waste in Title 23, CCR, Section 2522(a) includes "1) nonhazardous waste which consists of or contains pollutants which, under ambient environmental conditions at the waste management unit, could be released at concentrations in excess of applicable water quality objectives, or could cause degradation of waters of the State or 2) hazardous waste which has been granted a variance from hazardous waste management requirements pursuant to Section 66310 of Title 22 of this code." The determination of whether a waste poses a threat to water quality must take into account factors relating to the waste and to the site where the wastes are stored or discharged. The designated waste level values shown in Table 6 are those calculated for a hypothetical average site. In practice, site-specific and constituent-specific designated waste level calculations could yield different values from those shown in Table 6. For basin sites in the San Joaquin Valley where local ground water contains high levels of dissolved constituents, the designated levels calculated on the basis of background concentrations would be substantially higher than those shown in Table 6. If we utilize only the values in Table 6 as a hypothetical example for comparison to the data in Table 3, then all evaporation basins exceed the arsenic level and one basin (Basin 4) exceeds the selenium level. The limits of most critical nature to evaporation basins are those dealing with specific conductance(EC), total dissolved solids(TDS), chloride(Cl), sulfate(SO_4^{2-}) and boron(B). Based on the hypothetical example, part or all of 17 separate basins would exceed the limits shown in Table 6. The nature of the evaporation process leads to the logical conclusion that at some point in the evapoconcentration process, all evaporation basins will exceed the hypothetical limits for a designated waste. Because of the evaporation process, a complete evaluation of site characteristics and background water quality underlying the site will be important in defining designated waste levels.

VIII. REFERENCES

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APPENDIX A

APPENDIX A. Mineral Water Quality Data

SITE NAME	CELL	DATE	Ca	Mg	Na	K	HCO3	SO4	Cl	B	TDS	EC	pH
			mg/L										umhos/cm
1 SOUZA	SW-Inlet	07/22/87	70	66	250	6.9	340	320	200	2.1	1200	2000	7.9
3 BRITZ, SDP	Inlet	10/02/85	460	210	1100		370	2600	620		5200	6900	
3 BRITZ, SDP	Inlet	12/04/86	540	200	632		340	2040	503	7.8	2700	5010	
3 BRITZ, SDP	Inlet	07/23/87	430	160	690	5.6	300	2000	460	7.3	4400	5300	8.0
3 BRITZ, SDP	Inlet	02/17/88						2000	500	8.1			
3 BRITZ, SDP	Inlet	03/23/88					290	2100	520	7.7			
3 BRITZ, SDP	Inlet	04/13/88					280	1600	470	7.5			
3 BRITZ, SDP	North	12/04/86	590	260	968		60	3000	700	12	3500	6790	
3 BRITZ, SDP	North	02/17/88						2500	610	9.3			
3 BRITZ, SDP	North	03/23/88						250	2700	680	12		
3 BRITZ, SDP	South	12/04/86	510	210	688		160	2300	539	7.6	1300	5420	
3 BRITZ, SDP	South	07/23/87	340	99	470	5.4	270	1400	220	7.6	3100	3800	8.1
3 BRITZ, SDP	South	08/25/87					180	1300	410	6.6			3610
3 BRITZ, SDP	South	02/17/88						2200	540	8.4			
3 BRITZ, SDP	South	03/23/88					180	2400	580	9.4			
3 BRITZ, SDP	South	04/13/88					190	2100	590	9.9			
4 SUMNER PECK	1	12/02/86	540	150	3080		120	6440	1150	7.9	17000	14040	
4 SUMNER PECK	1	06/09/87	511	170	2820	11	134	5890	1050	7	11200	12600	8.3
4 SUMNER PECK	1-NE	02/04/88	560	160	2870		158	5440	1110	6.2	10800	13500	8.2
4 SUMNER PECK	1-NW Inlet	06/14/85	540	150	2100		320	4900	1000	6.2	9500	13000	
4 SUMNER PECK	1-NW Inlet	12/02/86	510	130	2530		260	5260	896	9.5	13000	11740	
4 SUMNER PECK	1-SE Inlet	06/14/85	530	140	1400		330	3500	530	5.5	6400	8400	
4 SUMNER PECK	1-SE Inlet	12/02/86	500	86	1060		240	2680	411	3.2	7200	6260	
4 SUMNER PECK	1-SE Inlet	06/09/87	462	148	1570	6.3	213	3680	551	5.6	7460	8450	8.1
4 SUMNER PECK	1-SE Inlet	02/04/88	540	125	2000		316	4240	813	4.3	8190	10600	7.8
4 SUMNER PECK	2	12/02/86	500	460	8080		140	14700	3110	23	34000	30300	
4 SUMNER PECK	2	06/09/87	672	214	6400	36	178	12400	2490	17	23400	24100	8.0
4 SUMNER PECK	2	02/04/88	550	390	7020		225	13900	2930	17	25800	30700	8.2
4 SUMNER PECK	3	12/02/86	520	220	4450		130	8920	1660	12	21000	18490	
4 SUMNER PECK	3	06/09/87	541	205	3510	14	121	7180	1330	8.6	13700	15000	8.1
4 SUMNER PECK	3	02/04/88	560	220	3980		233	7550	1670	8.8	15100	19500	8.0
4 SUMNER PECK	3-W Inlet	06/09/87	501	108	2100		220	4676	750	4.5	9600	9600	7.8
4 SUMNER PECK	4	12/02/86	460	430	8140		170	14400	3040	22	37000	30100	
4 SUMNER PECK	4	06/09/87	578	221	7140	42	194	13400	2820	20	25600	26100	7.9
4 SUMNER PECK	5	12/02/86	460	260	12000		160	21000	4660	34	43000	41100	
4 SUMNER PECK	5	06/09/87	572	271	9820	58	240	18300	3950	28	34600	33600	7.9
4 SUMNER PECK	5	02/04/88	580	520	9700		321	17900	3920	26	33300	39500	8.4
4 SUMNER PECK	6	06/09/87	583	169	2680	25	98	5710	1270	7.8	11000	12400	8.1
4 SUMNER PECK	6	02/04/88	510	210	3900		150	6850	1770	5.9	14500	19100	7.8
5 BRITZ-DEAV 5PTS	North	12/02/86	500	800	10000		300	22200	1790	72	32000	34800	
5 BRITZ-DEAV 5PTS	North	06/08/87	587	568	6120	7.4	233	14100	1120	48	24300	24300	8.2
5 BRITZ-DEAV 5PTS	North	02/04/88	560	410	5000		237	11800	868	35	18800	22400	8.6
5 BRITZ-DEAV 5PTS	South	12/02/86	440	850	10700		250	23600	1960	76	44000	36400	
5 BRITZ-DEAV 5PTS	South	06/08/87	561	408	4560	18	214	10900	790	36	18300	18300	8.2
5 BRITZ-DEAV 5PTS	South	02/04/88	500	360	4340		244	10100	783	32	16900	20100	8.5
5 BRITZ-DEAV 5PTS	S-Inlet	06/27/85	440	270	2700		290	7000	490	23	11000	14000	
5 BRITZ-DEAV 5PTS	S-Inlet	06/08/87	478	314	3590	3.9	256	8710	256	30	14500	14500	8.3
6 STONE LAND CO.	Inlet Sump 27	07/19/85	300	350	1600		500	4300	370	8.3	7100	9100	

APPENDIX A. Mineral Water Quality Data (cont.)

SITE NAME	CELL	DATE	Ca	Mg	Na	K	HCO ₃	S0 ₄	Cl	B	TDS	EC	pH
			mg/L	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6 STONE LAND CO.	Inlet Sump 27	06/10/87	319	427	1970	5.6	320	5450	530	9.5	9390	9850	8.2
6 STONE LAND CO.	Inlet Sump 3	06/10/87	441	920	7600	5.8	410	17500	1730	33	29300	26700	8.4
6 STONE LAND CO.	Inlet Sump 34F	07/19/85	250	400	2800		600	6400	690	9.2	11000	13000	
6 STONE LAND CO.	Inlet Sump 34F	06/10/87	399	645	4700	6.6	434	11000	1060	25	19000	18500	8.4
6 STONE LAND CO.	Inlet Sump 35	07/19/85	360	1000	6600		480	16000	1800	21	26000	29000	
6 STONE LAND CO.	Inlet Sump 36	06/10/87	371	965	6320	10	390	14300	1740	20	25700	23700	8.4
6 STONE LAND CO.	North	02/04/88	510	860	5500		351	13400	1420	25	22600	19000	8.3
6 STONE LAND CO.	North (a)	12/02/86	440	1100	7600		640	18700	1840	36	31000	29500	
6 STONE LAND CO.	North (a)	06/08/87	420	952	6280	9.7	276	15000	1510	31	26200	25900	8.4
6 STONE LAND CO.	North (b)	12/02/86	440	1200	8520		340	19200	2050	39	43000	31100	
6 STONE LAND CO.	North (b)	06/08/87	428	1020	6460	9.6	274	15500	1580	32	27200	27200	8.3
6 STONE LAND CO.	SE	02/04/88	730	5650	26800		824	69500	11900	167	118000	101000	8.4
6 STONE LAND CO.	SE (a)	12/02/86	470	6600	35100		560	78400	14200	200	150000	91100	
6 STONE LAND CO.	SE (a)	06/08/87	503	4370	29600	37	615	68200	7590	120	116000	116000	8.0
6 STONE LAND CO.	SE (b)	12/02/86	470	7500	31800		1300	75300	15600	43	140000	89100	
6 STONE LAND CO.	SE (b)	06/08/87	482	4380	30400	37	626	69800	7830	120	120000	120000	8.1
6 STONE LAND CO.	SW	02/04/88	640	2710	22400		326	47200	6230	85	86000	81100	8.7
6 STONE LAND CO.	SW	02/04/88	560	1260	10800		476	24000	2700	36	37300	40400	7.4
6 STONE LAND CO.	SW (a)	12/02/86	470	3200	29900		230	65500	7190	120	110000	77900	
6 STONE LAND CO.	SW (a)	06/08/87	523	2670	21500	19	432	47000	5330	87	83200	83200	8.6
6 STONE LAND CO.	SW (b)	12/02/86	500	3200	30200		270	65900	7100	120	120000	78800	
6 STONE LAND CO.	SW (b)	06/08/87	511	2610	20400	20	416	46300	5070	81	78600	55400	8.6
6 STONE LAND CO.	SW-Inlet	07/19/85	390	1100	8000		410	19000	2100	33	32000	35000	
6 STONE LAND CO.	SW-Inlet	06/10/87	428	1180	8580	8.1	352	19900	2350	31	34100	30200	8.4
7 CARLTON DUTY	AG Inlet	12/03/86	440	960	13400		510	31400	3480	47	51000	44600	
7 CARLTON DUTY	AG Inlet	06/08/87	554	2600	11800	4.9	340	26600	5000	28	51350	40200	8.2
7 CARLTON DUTY	Basin	12/03/86	460	12000	35200		2100	84200	25700	180	170000	120200	
7 CARLTON DUTY	Basin	06/08/87	584	8000	42400	55	1310	95500	16200	110	171000	85400	8.4
7 CARLTON DUTY	INCPTR Inlet	03/20/85	430	2200	11000		420	27000	5000	26	47000	54000	
7 CARLTON DUTY	INCPTR Inlet	12/03/86	400	1600	11500		550	27100	3910	29	47000	41300	
7 CARLTON DUTY	INCPTR Inlet	06/08/87	458	2030	11400	6.2	502	25100	4280	33	47400	38600	8.3
8 WESTLAKE-NORTH	1-N	12/02/86	330	670	7780		460	16000	1940	13	29000	28400	
8 WESTLAKE-NORTH	1-N	06/08/87	276	689	7240	7.6	283	14700	1770	14	26700	26300	8.3
8 WESTLAKE-NORTH	1-N	06/08/87	272	694	7260	7.7	284	14800	1780	14	26700	26500	8.2
8 WESTLAKE-NORTH	1-N	02/04/88	470	980	11100		403	23500	2750	23	40900	43000	7.2
8 WESTLAKE-NORTH	1-NW Inlet	07/16/85	260	560	5500		530	12000	1600	10	20000	25000	
8 WESTLAKE-NORTH	1-NW Inlet	06/08/87	213	243	2830	3.7	314	6160	507	7	10500	11900	8.6
8 WESTLAKE-NORTH	1-SW Inlet	07/16/85	210	580	6000		420	13000	1500	13	22000	25000	
8 WESTLAKE-NORTH	1-SW Inlet	12/02/86	320	550	6340		540	13200	1700	10	23000	24300	
8 WESTLAKE-NORTH	1-SW Inlet	06/08/87	340	628	6010	6.1	480	12600	1590	10	22700	22900	8.6
8 WESTLAKE-NORTH	2-Inlet	07/16/85	290	660	5700		360	12000	1300	11	19000	23000	
8 WESTLAKE-NORTH	2-Inlet	06/08/87	317	619	5640	6.2	485	12600	1580	10	22100	22400	8.5
8 WESTLAKE-NORTH	2-NE	06/08/87	426	1120	10000	11	385	21900	2560	20	38400	34800	8.1
8 WESTLAKE-NORTH	2-S	12/02/86	160	420	8580		390	19000	2120	16	36000	31700	
8 WESTLAKE-NORTH	2-S	12/02/86	430	1000	8600		390	17500	2160	16	34000	31900	
8 WESTLAKE-NORTH	2-S	02/04/88	520	1010	10900		571	23500	2920	19	38200	40800	8.2
8 WESTLAKE-NORTH	2-SE	06/08/87	427	1120	9480	11	388	22000	2570	20	38300	34900	8.1
8 WESTLAKE-NORTH	2-SW	06/08/87	435	1110	9320	12	394	21700	2550	20	38200	34600	8.2

APPENDIX A. Mineral Water Quality Data (cont.)

SITE NAME	CELL	DATE	Ca	Mg	Na	K	HC03	SO4	CL	B	TDS	EC	pH
			.....	mg/L	.....		.....	.....	.....	.....	.....	umhos/cm	
8 WESTLAKE-NORTH	S-Inlet	02/04/88	460	630	6600		634	13700	1790	10.6	23000	26300	7.8
9 MEYERS RANCH	A	12/03/86	200	310	2920		440	6050	1180	4.9	20000	13230	
9 MEYERS RANCH	A	06/08/87	220	580	4660	20	239	9620	1980	7.6	17800	18600	8.1
9 MEYERS RANCH	A	02/04/88	120	300	2390		342	5090	983	3.4	8920	11500	7.4
9 MEYERS RANCH	B	12/03/86	180	450	4280		180	8650	1720	6.3	18000	18090	
9 MEYERS RANCH	B	06/08/87	248	840	6800	25	127	13100	2880	11	25900	25600	8.0
9 MEYERS RANCH	B	02/04/88	180	370	3150		239	6610	1410	4.3	12000	15900	7.7
9 MEYERS RANCH	C	05/22/85	150	670	5200		420	10700	2500	6	19000	24000	
9 MEYERS RANCH	C	12/03/86	200	500	4680		300	9420	1860		14000	19320	
9 MEYERS RANCH	Inlet	05/22/85	180	200	1700		420	3300	620	2.6	4700	8000	
9 MEYERS RANCH	Inlet	12/03/86	150	180	2080		480	3560	793	3.5	8200	9350	
9 MEYERS RANCH	Inlet	06/08/87	160	202	1780	8.7	433	3230	741	3.1	6760	8250	8.6
10 BARBIZON FARMS	East	12/03/86	120	450	8220		470	11500	4980	14	17000	31300	
10 BARBIZON FARMS	East	06/08/87	83	329	4870	14	470	6570	3110	8.2	16000	19200	8.1
10 BARBIZON FARMS	E-Inlet	07/15/85	65	170	2000		720	2700	1200	3.7	6500	10000	
10 BARBIZON FARMS	E-Inlet	06/10/87	108	144	2165	6	556	2795	1405	3.3	7130	9420	8.6
10 BARBIZON FARMS	Middle	12/03/86	110	440	8040		470	11200	4880	13	27000	30700	
10 BARBIZON FARMS	Middle	06/08/87	88	407	6000	18	454	8660	3760	10	19600	22700	7.8
10 BARBIZON FARMS	West	12/03/86	130	430	7720		520	10700	4600	13	26000	29200	
10 BARBIZON FARMS	West	06/08/87	134	482	6960	20	465	10300	4330	12	22900	25600	7.9
10 BARBIZON FARMS	W-Inlet	07/15/85	220	330	2800		720	4800	1600	5.3	10000	14000	
10 BARBIZON FARMS	W-Inlet	12/03/86	290	270	3600		660	5630	2030	6.4	12000	15750	
10 BARBIZON FARMS	W-Inlet	06/10/87	293	343	3920	12	529	6160	2350	7.1	13900	16100	8.3
11 TLDD, NORTH	1	12/03/86	69	74	1760		560	1720	1220	3.0	5700	7940	
11 TLDD, NORTH	1	06/08/87	39	56	1340		608	1669	800	2.6	4045	5700	8.6
11 TLDD, NORTH	2A	12/03/86	14	72	2270		470	2460	1480	4.0	7000	9880	
11 TLDD, NORTH	2A	06/08/87	19	110	2130		724	2716	1200	3.8	6550	8800	8.5
11 TLDD, NORTH	2B	12/03/86	47	71	1800		530	1820	1240	3.3	3500	8030	
11 TLDD, NORTH	2B	06/08/87	12	51	1390		570	1569	870	2.5	4295	6000	8.9
11 TLDD, NORTH	3A	12/03/86	24	82	2460		470	2760	1510	4.4	7200	10450	
11 TLDD, NORTH	3A	06/08/87	28	75	2110		739	2429	1200	3.6	6125	8300	8.5
11 TLDD, NORTH	3B	12/03/86	25	76	2100		170	2240	1360	4.8	6800	9170	
11 TLDD, NORTH	3B	06/08/87	18	59	1700		650	1927	1000	3.3	5150	7200	8.5
11 TLDD, NORTH	4	12/03/86	15	69	2920		600	3150	1740	5.4	6600	11910	
11 TLDD, NORTH	4	06/08/87	31	93	2180		764	2812	1200	3.8	6915	8900	8.4
11 TLDD, NORTH	5A	12/03/86	12	76	3310		430	3750	1980	6.1	11000	13620	
11 TLDD, NORTH	5A	06/08/87	29	109	2630		762	3099	1300	4.1	7125	9400	8.4
11 TLDD, NORTH	5B	12/03/86	15	100	3670		600	4100	2110	6.9	11000	14640	
11 TLDD, NORTH	5B	06/08/87	25	114	3220		970	4103	1900	6.1	10290	13100	8.4
11 TLDD, NORTH	6	12/03/86	21	180	4740		780	5980	2660	8.7	16000	18380	
11 TLDD, NORTH	6	06/08/87	31	132	2790		834	3768	1600	5.3	8750	11400	8.4
11 TLDD, NORTH	7	12/03/86	46	270	6920		720	9050	3800	13	26000	25800	
11 TLDD, NORTH	7	06/08/87	47	188	4950		1149	5456	2500	8.3	14220	15900	8.4
11 TLDD, NORTH	Inlet	12/03/86	110	79	1700		16	1770	1180	2.8	5200	7780	
11 TLDD, NORTH	Inlet	06/08/87	92	47	1090		676	1193	700	2.2	3650	5100	8.6
12 WESTLAKE #3	1	12/03/86	430	1200	8400		260	14500	6640	18	38000	35200	
12 WESTLAKE #3	1	06/08/87	907	1430	9570		220	16928	6400		35850	35300	7.7
12 WESTLAKE #3	1	01/26/88	400	540	2950		259	5910	2020	6.3	12800	14300	7.3

APPENDIX A. Mineral Water Quality Data (cont.)

SITE NAME	CELL	DATE	Ca	Mg	Na	K	HCO ₃	SO ₄	Cl	B	TDS	EC	pH
			mg/L				mg/L				umhos/cm		
12 WESTLAKE #3	2	12/03/86	370	590	3880		170	7690	2870	10	16000	18830	
12 WESTLAKE #3	2	06/08/87	495	965	4640	64	167	9910	3550	11	21500	22600	8.0
12 WESTLAKE #3	2	01/26/88	500	860	4880		259	10100	3630	8.1	20800	24100	7.1
12 WESTLAKE #3	3	12/03/86	330	470	2820		210	5750	1990	6.8	12000	14310	
12 WESTLAKE #3	3	06/08/87	410	755	3660	48	147	7440	2460	8.9	16700	17900	8.1
12 WESTLAKE #3	3	01/26/88	620	1900	12200		425	20700	8790	26	45000	50400	7.9
12 WESTLAKE #3	3-Inlet	07/15/85	600	1400	8000		270	14000	6600	14	30000	37000	
12 WESTLAKE #3	3-Inlet	12/03/86	280	390	2540		240	5240	1790	11	13000	13140	
12 WESTLAKE #3	3-Inlet	06/08/87	538	670	4980		330	10475	2100	8.8	18825	19200	7.9
12 WESTLAKE #3	4	12/03/86	470	2400	18900		320	30100	15200	38	79000	65800	
12 WESTLAKE #3	4	06/08/87	665	2630	15800	148	403	25300	13100	35	62100	56800	7.9
12 WESTLAKE #3	4	01/26/88	760	4410	28700		747	49300	20900	41	98100	81900	8.3
12 WESTLAKE #3	4-Inlet	12/03/86	370	1800	13600		510	20500	11000	29	49000	51400	
12 WESTLAKE #3	5	12/03/86	470	870	5640		170	10500	4370	12	27000	25900	
12 WESTLAKE #3	5	06/08/87	650	1230	6840	81	192	12200	5710	15	29400	28900	7.9
12 WESTLAKE #3	5	01/26/88	720	2100	12700		394	20300	8630	24	44800	41700	7.7
12 WESTLAKE #3	6	12/03/86	430	630	4050		130	7640	3170	9.5	17000	19850	
12 WESTLAKE #3	6	06/08/87	640	745	5355		230	8200	4350	9.9	20800	22400	7.9
12 WESTLAKE #3	6	01/26/88	740	1190	9600		304	14100	8680	18	35300	36200	7.5
13 J & W FARMS	A	06/04/85	570	3700	40000		740	60000	28000	61	130000	110000	
13 J & W FARMS	B	06/04/85	570	6100	53000		1500	77000	45000	120	190000	150000	
13 J & W FARMS	B	12/03/86	230	230	2970		360	4380	2070	6.2	9700	13570	
13 J & W FARMS	B-Inlet	06/04/85	290	230	230		670	3700	1900	5.8	9000	13000	
13 J & W FARMS	C	06/04/85	980	2900	11000		590	21000	10000	31	47000	54000	
13 J & W FARMS	C	12/03/86	360	360	4080		510	6770	2650	10	14000	18530	
13 J & W FARMS	C-Inlet	06/04/85	900	2100	8000		580	16000	7700	22	35000	43000	
13 J & W FARMS	C-Inlet	12/03/86	260	300	2830		470	4780	1970	9.3	8300	13530	
14 PRYSE FARMS		12/03/86	470	2900	38200		600	35300	41400	57	130000	116800	
14 PRYSE FARMS	1	12/03/86	310	1100	14500		550	15700	12900	20	49000	53300	
14 PRYSE FARMS	1	06/10/87	222	1180	14800	45	512	17400	14000	22	50900	52000	8.3
14 PRYSE FARMS	2	06/12/85	530	2400	35000		600	39000	31000	44	110000	110000	
14 PRYSE FARMS	2	12/03/86	480	2900	38400		590	36100	41300	57	120000	117000	
14 PRYSE FARMS	2	06/10/87	536	3720	56600	160	491	73000	45300	75	185000	123000	7.7
14 PRYSE FARMS	Inlet	06/12/85	310	1100	14000		630	16000	13000	18	45000	58000	
14 PRYSE FARMS	Inlet	12/03/86	380	1100	8280		850	9590	7120	10	29000	33500	
14 PRYSE FARMS	Inlet	06/10/87	283	590	7500	22	592	9000	6790	9.8	25700	29400	8.3
15 BOWMAN FARMS	A	06/04/85	730	1300	13000		83	14000	15000	19	45000	59000	
15 BOWMAN FARMS	A	12/03/86	750	1400	14500		240	15300	15600	16	50000	56800	
15 BOWMAN FARMS	A	06/09/87	728	1150	11000	31	142	12700	12900	11	41000	43600	8.2
15 BOWMAN FARMS	B	06/09/87	898	1960	18900	59	168	19200	21700	23	68000	66100	8.0
15 BOWMAN FARMS	NE-Inlet	06/04/85	530	590	4800		410	5200	6500	7.2	18000	27000	
15 BOWMAN FARMS	NE-Inlet	12/03/86	510	330	2830		380	4200	2590	4.5	9900	14440	
15 BOWMAN FARMS	NE-Inlet	06/09/87	473	485	3840	15	278	4760	4690	4.7	15200	18600	8.2
15 BOWMAN FARMS	NW-Inlet	06/04/85	510	1100	12000		780	14000	13000	19	43000	55000	
15 BOWMAN FARMS	NW-Inlet	12/03/86	600	1300	13600		610	15200	13800	15	44000	53400	
15 BOWMAN FARMS	NW-Inlet	06/09/87	588	1390	14000	36	611	16200	15000	15	50500	51000	8.3
16 MORRIS FARMS	Cell	06/12/85	750	1500	20000		410	24000	20000	37	67000	79000	
16 MORRIS FARMS	Cell	12/03/86	630	3200	40800		530	37600	42200	68	117000	118800	

APPENDIX A. Mineral Water Quality Data (cont.)

SITE NAME	CELL	DATE	Ca	Mg	Na	K	HCO ₃	SO ₄	Cl	B	TDS	EC	pH
			mg/L	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16 MORRIS FARMS	Cell	06/09/87	810	1210	15600	70	257	17800	15300	25	53800	53800	8.1
16 MORRIS FARMS	Inlet	06/12/85	390	400	4800		720	5800	4800	9.2	17000	23000	
16 MORRIS FARMS	Inlet	12/03/86	430	480	6880		600	7470	6750	9.3	22000	29600	
16 MORRIS FARMS	Inlet	06/09/87	347	429	5440	24	457	6700	5200	9.9	19500	23100	8.0
17 MARTIN FARMS	Cell	06/12/85	430	970	16000		540	27000	12000	47	60000	66000	
17 MARTIN FARMS	Cell	12/03/86	430	1300	24500		300	34400	16600	55	78000	76500	
17 MARTIN FARMS	Cell	06/09/87	611	1460	23600	80	362	33000	15800	54	78400	68600	8.0
17 MARTIN FARMS	Inlet	06/12/85	200	210	3200		540	4400	2100	7.6	11000	15000	
17 MARTIN FARMS	Inlet	12/03/86	300	250	4320		610	5770	2990	8.3		18200	
19 4-J CORP	Cell	06/10/87	8	284	21400	142	4370	26600	12500	62	65800	63000	9.0
19 4-J CORP	N-Inlet	06/10/87	35	144	6180	41	1560	7730	3580	18	19200	23200	8.7
21 TLDD HACIENDA	A1	12/02/86	47	240	2860		270	4070	1840	4.6	19000	12830	
21 TLDD HACIENDA	A1	06/08/87	99	184	2480	12	458	3150	1630	5.2	8320	11200	8.5
21 TLDD HACIENDA	A1-Inlet	06/08/87	140	140	1990	10	586	2540	1310	4.3	6780	9230	8.7
21 TLDD HACIENDA	A2	06/08/87	53	365	4580	25	275	6370	3000	9.7	15300	19100	8.0
21 TLDD HACIENDA	A2	06/08/87	50	296	3800	20	261	5220	2420	7.6	12600	16100	8.1
21 TLDD HACIENDA	A3	06/08/87	87	720	8640	48	510	12600	5490	17	29200	32300	8.1
21 TLDD HACIENDA	A4	12/02/86	180	3200	32800		760	43400	22600	66	96000	91400	
21 TLDD HACIENDA	A4	06/08/87	107	2890	31900	180	985	45600	22200	68	107000	88700	8.0
21 TLDD HACIENDA	C1	12/02/86	60	270	3160		280	4560	2030	5.3	13000	13960	
21 TLDD HACIENDA	C1	06/09/87	32	249	3140	16	257	4360	2100	6.6	10400	13800	8.1
21 TLDD HACIENDA	C2	06/09/87	54	525	6240	34	452	8700	4090	13	21000	24900	8.1
21 TLDD HACIENDA	C3	06/09/87	85	1050	12600	62	777	17800	8180	26	42200	44100	8.0
21 TLDD HACIENDA	C4	12/02/86	130	3000	38600		1200	54400	26700	75	150000	103600	
21 TLDD HACIENDA	C4 NE Corner	06/09/87	105	2880	33450	170	1455	47250	22950	66	112000	90400	8.3
21 TLDD HACIENDA	C4 SW Corner	06/09/87	90	3330	38800	200	1560	55100	26700	76	129000	98900	8.4
21 TLDD HACIENDA	Marsh N Cell	06/09/87	74	232	3070	18	347	4210	1990	7.1	10100	13300	8.3
21 TLDD HACIENDA	Marsh S Cell	06/09/87	94	278	3500	24	305	5070	2320	8.3	11900	15300	8.1
22 TLDD, SOUTH	1 SE Side	06/09/87	74	322	4160	18	338	5610	2740	9.2	13600	17300	8.3
22 TLDD, SOUTH	1 SW Side	06/09/87	73	323	4180	18	404	5710	2770	9.2	13900	17400	8.3
22 TLDD, SOUTH	10	12/02/86	340	4300	43900		1400	46000	44000	140	120000	122800	
22 TLDD, SOUTH	10	06/09/87	170	2485	31500	160	981	40800	24000	78	104000	88600	8.4
22 TLDD, SOUTH	2	06/09/87	67	369	4640	20	290	6520	3090	10	15400	19200	8.3
22 TLDD, SOUTH	3	06/09/87	86	482	6180	29	399	8570	4040	14	20400	24300	8.2
22 TLDD, SOUTH	4	12/02/86	160	1300	18900		600	26800	12200	38	75000	61900	
22 TLDD, SOUTH	4	06/09/87	124	982	13000	58	678	18600	8610	29	42900	45000	8.2
22 TLDD, SOUTH	5	06/09/87	124	1120	15900	70	751	22400	10100	36	52200	52300	8.1
22 TLDD, SOUTH	6	06/09/87	68	401	5120	23	310	7180	3410	11	17000	21100	8.2
22 TLDD, SOUTH	7	06/09/87	94	422	5540	23	408	7810	3540	12	17900		
22 TLDD, SOUTH	8	06/09/87	126	620	8480	37	555	12300	5550	18	27900		
22 TLDD, SOUTH	9	06/09/87	157	1110	15200	66	745	21600	10050	33	49850		
22 TLDD, SOUTH	Inlet	12/02/86	210	290	3255		340	4920	2040	4.5	12000	14570	
22 TLDD, SOUTH	Inlet	06/09/87	156	208	3100	12	588	4040	2140	7.1	10300	13600	8.6
22 TLDD, SOUTH	Perim. Drain	06/09/87	302	548	10300	24	756	14000	6700	28	33300	36800	8.3
22 TLDD, SOUTH	Salt Basin	12/02/86	110	2900	34200		1300	42200	28800	96	170000	100800	
22 TLDD, SOUTH	Salt Basin	06/09/87	66	478	6520	29	428	9180	4170	15	21500	25500	8.2
23 LOST HILLS WD	1 North	01/26/88	770	440	10600		201	13400	8200	69	34300	37500	8.7
23 LOST HILLS WD	1 (a)	06/09/87	583	485	10600	10	228	13800	8720	75	35900	38300	8.3

APPENDIX A. Mineral Water Quality Data (cont.)

SITE NAME	CELL	DATE	Ca	Mg	Na	K	HCO ₃	SO ₄	Cl	B	TDS	EC	pH
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	umhos/cm
23 LOST HILLS WD	1 (b)	12/02/86	620	520	13500		40	15800	11000	88	54000	49500	
23 LOST HILLS WD	1 (c)	06/09/87	619	481	10800	10	238	14000	8740	75	35500	38000	8.4
23 LOST HILLS WD	1-Inlet	07/03/85	530	220	5300		220	7700	3700	38	18000	24000	
23 LOST HILLS WD	1-Inlet	06/09/87	520	137	2210	2.1	131	4010	1700	17	9560	11100	8.2
23 LOST HILLS WD	1-Inlet	01/26/88	560	220	4440		186	6140	3550	29	15300	18600	7.9
23 LOST HILLS WD	3A	07/03/85	570	1600	40000		74	31400	44000	160	120000	140000	
23 LOST HILLS WD	3A	01/26/88	950	1250	30900		701	29200	31500	174	97500	100000	8.5
23 LOST HILLS WD	3A North	12/02/86	530	1400	43800		510	37700	43900	130	120000	121700	
23 LOST HILLS WD	3A North	06/09/87	715	1140	27200	23	496	25500	27200	140	85800	81800	8.4
23 LOST HILLS WD	3A South	06/09/87	671	1105	26750	22	482	24750	26600	140	84300	80200	8.4
23 LOST HILLS WD	3A-Inlet	06/09/87	626	448	9200	5.5	236	10900	7930	64	31400	34700	8.2
23 LOST HILLS WD	3B	01/26/88	810	780	20900		283	19800	21000	93	67200	69800	8.6
23 LOST HILLS WD	3B North	06/09/87	616	765	18400	14	313	18600	17600	96	57700	59600	8.6
23 LOST HILLS WD	3B South	06/09/87	651	705	17600	14	294	18000	17200	83	56000	58400	8.4
23 LOST HILLS WD	3B-Inlet	07/03/85	590	610	15000		230	12000	18000	50	47000	65000	
23 LOST HILLS WD	3C	06/09/87	572	532	11400	11	256	14300	9230	82	38300	40700	8.3
23 LOST HILLS WD	3C	01/26/88	810	470	11900		201	14800	9500	66	36400	39300	8.7
23 LOST HILLS WD	Borrow Pit	06/09/87	366	169	3440	12	99	3690	3530	16	11800	15400	8.2
23 LOST HILLS WD	Borrow Pit	01/26/88	520	260	6800		70	5670	6750	24	19800	25200	8.9
24 CARMEL RANCH	1	06/10/87	82	165	12500	25	644	14300	9070	44	37100		
24 CARMEL RANCH	1-Inlet	05/23/85	160	120	6000		670	7200	4500	18	19000	27000	
24 CARMEL RANCH	1-Inlet	12/02/86	220	140	9140		720	10000	6850	32	27000	34100	
24 CARMEL RANCH	1-Inlet	06/10/87	124	106	5740	13	565	6010	4310	22	17000		
24 CARMEL RANCH	2	12/02/86	320	4400	117000		2600	30600	171000	460	310000	>200000	
24 CARMEL RANCH	2	06/10/87	230	310	37700	58	868	46200	25600	130	112000		
24 CARMEL RANCH	3	06/10/87	82	240	8220	10	541	9330	5990	30	24200		
24 CARMEL RANCH	4	06/10/87	71	128	4590	6.5	385	5270	3170	17	13600		
24 CARMEL RANCH	4A-Inlet	05/23/85	160	120	3600		540	3800	2900	8.6	9800	15000	
24 CARMEL RANCH	4B-Inlet	05/23/85	280	140	4800		520	5500	3800	10	14000	22000	
24 CARMEL RANCH	5	06/10/87	41	2660	138000	460	2890	76000	155000	840	388000		
24 CARMEL RANCH	6	05/23/85	160	120	29000		970	32000	24000	91	80000	90000	
25 LOST HILLS RANCH	1	05/29/85	110	180	7600		470	8100	6900	17	23000	34000	
25 LOST HILLS RANCH	1	12/02/86	82	120	5240		300	5390	4130	17	20000	21200	
25 LOST HILLS RANCH	1	06/10/87	83	113	5060	14	402	5470	4120	12	15300	20600	8.3
25 LOST HILLS RANCH	1-Inlet	06/10/87	99	109	4780	14	430	5200	3880	13	14600	19600	8.4
25 LOST HILLS RANCH	2	06/10/87	72	140	8040	16	325	8430	6630	19	23800	30400	8.6
25 LOST HILLS RANCH	3	05/29/85	160	420	25000		510	25000	19000	23	72000	85000	
25 LOST HILLS RANCH	3	12/02/86	100	130	10800		340	10600	8750	25	29000	39500	
25 LOST HILLS RANCH	3	06/10/87	95	242	13700	37	589	14100	11300	35	40400	47300	8.5
26 SAM ANDREWS' SONS 1		12/18/86	480	760			210			42	27000		
26 SAM ANDREWS' SONS 1		06/11/87	622	3520	33200	132	743	72400	8260	194	128000	77000	8.6
26 SAM ANDREWS' SONS 1-Inlet		06/17/85	470	500	4500		360	10000	1200	26	19000	22000	
26 SAM ANDREWS' SONS 1-Inlet		12/18/86	440	520			340			22	20000		
26 SAM ANDREWS' SONS 2A		06/11/87	534	1100	10600	45	312	24800	2620	66	42700	35900	8.6
26 SAM ANDREWS' SONS 2B		06/11/87	507	860	8480	33	269	18400	2040	51	33400	29600	8.5
26 SAM ANDREWS' SONS 3A		06/11/87	534	1120	10700	46	324	24400	2620	66	42600	35800	8.6
26 SAM ANDREWS' SONS 3B		12/18/86	630	1600			28			98	58000		
26 SAM ANDREWS' SONS 3B		06/11/87	596	1490	13900	62	409	30300	3530	91	56500	44100	8.8

APPENDIX A. Mineral Water Quality Data (cont.)

SITE NAME	CELL	DATE	Ca	Mg	Na	K	HCO ₃	SO ₄	Cl	B	TDS	EC	pH
.....mg/L.....													.....umhos/cm.....
26 SAM ANDREWS' SONS 4A		06/17/85	550	2300	26000		29	54000	6200	140	90000	94000	
26 SAM ANDREWS' SONS 4A		12/18/86	800	2800			280			180	120000		
26 SAM ANDREWS' SONS 4A		06/11/87	650	1960	19900	92	594	43600	5160	124	79100	57000	8.6
26 SAM ANDREWS' SONS 4B		12/18/86	880	2800			580			260	130000		
26 SAM ANDREWS' SONS 4B		06/11/87	582	1710	17500	78	581	36700	4420	118	67000	50600	8.4
26 SAM ANDREWS' SONS 4B		06/11/87	594	1660	16600	76	563	35500	4220	102	64600	49300	8.5

APPENDIX B

APPENDIX B. Trace Element Water Quality Data

SITE NAME	CELL	DATE	As	Cd	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Se	Zn
								ug/L					
1 SOUZA	SW-Inlet	07/22/87			3	2			7	<5	23	3.4	4
3 BRITZ, SDP	Inlet	10/02/85	<50			<1						5.1	
3 BRITZ, SDP	Inlet	04/13/88			1	<1				<5	<5		5
3 BRITZ, SDP	Inlet	02/17/88			<1	<1				16	<5	4.3	2
3 BRITZ, SDP	Inlet	06/02/87							114			1.9	
3 BRITZ, SDP	Inlet	03/23/88			1	<1					5	<5	<1
3 BRITZ, SDP	Inlet	12/04/86	4	<10	<10	<10				<20	<10	2.6	<10
3 BRITZ, SDP	North	02/17/88			3	2				9	<5	1.4	6
3 BRITZ, SDP	North	03/23/88			7	3				15	<5		10
3 BRITZ, SDP	North	12/04/86	2	<10	<10	<10				<20	<10	1.4	<10
3 BRITZ, SDP	North	06/02/87							325			2.3	
3 BRITZ, SDP	South	08/25/87			2	4				8	<5	5.9	7
3 BRITZ, SDP	South	12/04/86	<1	<10	<10	<10				<20	<10	1.4	<10
3 BRITZ, SDP	South	02/17/88			<1	<1				6	<5	2.5	2
3 BRITZ, SDP	South	04/13/88			2	2				<5	<5		4
3 BRITZ, SDP	South	06/02/87							152			6.6	
3 BRITZ, SDP	South	03/23/88			<1	1				7	<5	<1	
4 SUMNER PECK	1	08/28/85	<50			<1						720	
4 SUMNER PECK	1	12/02/86	2	<50	<10	<10			103	<20	<10	885	<10
4 SUMNER PECK	1	06/09/87	3	<100	<10	<10	<0.2	21	84	<20	<100	855	15
4 SUMNER PECK	1-NE	02/04/88	<10							92		634	
4 SUMNER PECK	1-NW Inlet	12/02/86	3	<10	<10	<10			83	<20	<10	804	<10
4 SUMNER PECK	1-NW Inlet	06/14/85		<50			<1					865	
4 SUMNER PECK	1-NW Inlet	06/09/87	4	<100	<10	14				<20	<100	943	<10
4 SUMNER PECK	1-SE Inlet	06/14/85		<50			<1					305	
4 SUMNER PECK	1-SE Inlet	06/09/87	2	<100	<10	<10	<0.2	<10	45	<20	<100	460	<10
4 SUMNER PECK	1-SE Inlet	12/02/86	2	<10	<10	<10			40	<20	<10	389	<10
4 SUMNER PECK	1-SE Inlet	02/04/88	<10						43			845	
4 SUMNER PECK	2	12/02/86	5	<50	<10	<10				<20	<50		13
4 SUMNER PECK	2	02/04/88	<10						228			1309	
4 SUMNER PECK	2	06/09/87	4	<100	<10	10	<0.2	27	188	38	<100	1314	16
4 SUMNER PECK	2	08/28/85		<50			<1					984	
4 SUMNER PECK	3	06/09/87	3	<100	<10	<10	<0.2	19	96	<20	<100	866	10
4 SUMNER PECK	3	08/28/85		<50			<1					801	
4 SUMNER PECK	3	12/02/86	4	<50	<10	<10			106	<20	<10	757	<10
4 SUMNER PECK	3	02/04/88	<10						115			624	
4 SUMNER PECK	3-W Inlet	06/09/87	3	<100	<10	13	<0.2	<10	58	<20	<100	585	<10
4 SUMNER PECK	4	06/09/87	4	<100	<10	10	<0.2	43	190	24	<100	1443	20
4 SUMNER PECK	4	08/28/85		<50			<1					1190	
4 SUMNER PECK	4	12/02/86	5	<50	<10	<10			226	<20	<50	1560	13
4 SUMNER PECK	5	08/28/85		<50			<1					1494	
4 SUMNER PECK	5	12/02/86	4	<50	<10	<10			420	<20	<50	1900	13
4 SUMNER PECK	5	02/04/88	<10						307			1566	
4 SUMNER PECK	5	06/09/87	5	<100	<10	13	<0.2	35	286	32	<100	1717	46
4 SUMNER PECK	6	02/04/88	<10						136			538	
4 SUMNER PECK	6	06/09/87	5	<100	<10	10	<0.2	21	88	<20	<100	467	12
5 BRITZ-DEAV 5PTS	North	02/04/88	<10						334			70	
5 BRITZ-DEAV 5PTS	North	12/02/86	10	<50	<10	<10			622	<20	<50	25	<10
5 BRITZ-DEAV 5PTS	North	06/08/87	10	<100	<10	<10	<0.2	44	391	<20	<100	37	12

APPENDIX B. Trace Element Water Quality Data (cont.)

SITE NAME	CELL	DATE	As	Cd	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Se	Zn
			.....ug/L.....										
5 BRITZ-DEAV 5PTS	South	06/08/87	5	<100	<10	<10	<0.2	76	313	<20	<50	35	<10
5 BRITZ-DEAV 5PTS	South	12/02/86	2	<50	<10	<10			650	<20	<50	34	<10
5 BRITZ-DEAV 5PTS	South	02/04/88	<10						312			83	
5 BRITZ-DEAV 5PTS	S-Inlet	06/08/87	3	<100	39	<10	<0.2	<10	325	<20	<50	93	11
5 BRITZ-DEAV 5PTS	S-Inlet	06/27/85		<50			<1					72	
6 STONE LAND CO.	Inlet Sump 27	06/10/87	4	<100	<10	<10	<0.2	1600	128	<20	<100	0.7	<10
6 STONE LAND CO.	Inlet Sump 27	07/19/85		<50			<1					1.1	
6 STONE LAND CO.	Inlet Sump 34F	06/10/87	4	<100	<10	<10	<0.2	470	412	<20	<100	3.1	<10
6 STONE LAND CO.	Inlet Sump 34F	07/19/85		<50			<1					3.1	
6 STONE LAND CO.	Inlet Sump 35	07/19/85		<50			<1					<1	
6 STONE LAND CO.	Inlet Sump 3	06/10/87	8	<100	<10	<10	<0.2	250	724	<20	<100	6.2	<10
6 STONE LAND CO.	Inlet Sump 36	06/10/87	2	<100	<10	<10	<0.2	1500	192	<20	<100	0.3	16
6 STONE LAND CO.	North	02/04/88	<10						304			2.1	
6 STONE LAND CO.	North (a)	06/08/87	12	<100	<10	<10	<0.2	140	358	<20	<100	1.6	21
6 STONE LAND CO.	North (a)	12/02/86	13	<50	<10	<10			448	<20	<50	1.6	<10
6 STONE LAND CO.	North (b)	12/02/86	16	<50	<10	<10			458	<20	<50	1.7	<10
6 STONE LAND CO.	North (b)	06/08/87	13	<100	<10	<10	<0.2	80	370	<20	<100	2.1	<10
6 STONE LAND CO.	SE	02/04/88	<20						1140			1.9	
6 STONE LAND CO.	SE (a)	06/08/87	40	<100	<10	<10	<0.2	340	902	22	<100	2.1	14
6 STONE LAND CO.	SE (a)	12/02/86	30	<100	<10	<10			2075	<20	<50	2.4	<10
6 STONE LAND CO.	SE (b)	12/02/86	34	<100	<10	<10			2165	<20	<50	2.1	<10
6 STONE LAND CO.	SE (b)	06/08/87	41	<100	<10	<10	<0.2	260	965	27	<100	0.7	16
6 STONE LAND CO.	SW	02/04/88	<10						438			2.2	
6 STONE LAND CO.	SW	02/04/88	<10						875			2.4	
6 STONE LAND CO.	SW Inlet	06/10/87	5	<100	<10	<10	<0.2	520	636	<20	<100	4.3	<10
6 STONE LAND CO.	SW (a)	12/02/86	12	<100	<10	<10			1645	54	<50	5.8	<10
6 STONE LAND CO.	SW (a)	06/08/87	22	<100	<10	<10	<0.2	130	1002	<20	<100	2.9	<10
6 STONE LAND CO.	SW (b)	12/02/86	10	<100	<10	<10			1660	22	53	5.1	<10
6 STONE LAND CO.	SW (b)	06/08/87	20	<100	<10	<10	<0.2	170	985	<20	<100	2.6	23
6 STONE LAND CO.	SW Inlet	07/19/85		<50			<1					9.1	
7 CARLTON DUTY	AG Inlet	12/03/86	140	<50	21	<10			1050	<20	<50	32	12
7 CARLTON DUTY	AG Inlet	06/08/87	5	<100	20	<10	<0.2	<10	245	<20	<100	17	<10
7 CARLTON DUTY	Basin	12/03/86	50	<100	<10	<10			590	23	<50	17	<10
7 CARLTON DUTY	Basin	06/08/87	200	<100	<10	<10	<0.2	62	866	21		15	<10
7 CARLTON DUTY	INCPTR Inlet	03/20/85		<50			<1					11	
7 CARLTON DUTY	INCPTR Inlet	12/03/86	80	<50	<10	<10			590	<20	<50	13	30
7 CARLTON DUTY	INCPTR Inlet	06/08/87	50	<100	<10	<10	<0.2	<10	504	<20	<100	15	<10
8 WESTLAKE-NORTH	1-N	02/04/88	<10						804			1.1	
8 WESTLAKE-NORTH	1-N	06/08/87	23	<100	<10	<10	<0.2	160	572	<20	<100	0.4	<10
8 WESTLAKE-NORTH	1-N	12/02/86	42	<50	<10	<10			518	<20	<10	1.6	40
8 WESTLAKE-NORTH	1-N	06/08/87	20	<100	<10	<10	<0.2	150	546	<20	<100	1.6	<10
8 WESTLAKE-NORTH	1-NW Inlet	07/16/85		<50			<1					<1	
8 WESTLAKE-NORTH	1-NW Inlet	06/08/87	12	<100	<10	<10	<0.2	20	408	<20	<100	2.1	<10
8 WESTLAKE-NORTH	1-SW Inlet	07/16/85		<50			<1					<1	
8 WESTLAKE-NORTH	1-SW Inlet	06/08/87	14	<100	<10	<10	<0.2	740	338	<20	<100	0.6	<10
8 WESTLAKE-NORTH	1-SW Inlet	12/02/86	33	<50	<10	<10			357	<20	<10	1.1	<10
8 WESTLAKE-NORTH	2-Inlet	06/08/87	11	<100	<10	<10	<0.2	860	296	<20	<100	0.5	10
8 WESTLAKE-NORTH	2-Inlet	07/16/85		<50			<1					4.1	
8 WESTLAKE-NORTH	2-NE	06/08/87	21	<100	<10	<10	<0.2	100	586	<20	<100	1.9	<10

APPENDIX B. Trace Element Water Quality Data (cont.)

SITE NAME	CELL	DATE	As	Cd	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Se	Zn
								.....ug/L.....					
8 WESTLAKE-NORTH	2-S	02/04/88	40					448			1.1		
8 WESTLAKE-NORTH	2-S	12/02/86	45	<50	<10	<10		558	<20	<10	2.9	<10	
8 WESTLAKE-NORTH	2-SE	06/08/87	26	<100	<10	<10	<0.2	110	584	<20	<10	2.1	<10
8 WESTLAKE-NORTH	2-SW	06/08/87	24	<100	<10	<10	<0.2	120	570	<20	<10	0.7	<10
8 WESTLAKE-NORTH	S-Inlet	02/04/88	28					277			0.8		
9 MEYERS RANCH	A	06/08/87	13	<100	<10	<10	0.3	110	407	<20	<100	0.3	<10
9 MEYERS RANCH	A	12/03/86	12	<50	<10	<10		294	<20	<10	1.2	<10	
9 MEYERS RANCH	A	02/04/88	18					232			0.3		
9 MEYERS RANCH	B	06/08/87	8	<100	<10	<10	0.4	10	698	<20	<100	0.2	<10
9 MEYERS RANCH	B	02/04/88	<10					316			0.4		
9 MEYERS RANCH	B	12/03/86	4	<50	<10	<10		420	<20	<10	0.8	<10	
9 MEYERS RANCH	C	12/03/86	2	<50	<10	<10		441	<20	<10	1.6	<10	
9 MEYERS RANCH	C	05/22/85		<50			<1				1.1		
9 MEYERS RANCH	Inlet	05/22/85		<50			<1				1.1		
9 MEYERS RANCH	Inlet	12/03/86	20	<10	<10	<10		297	<20	<10	1.5	<10	
9 MEYERS RANCH	Inlet	06/08/87	13	<100	<10	<10	<0.2	120	228	<20	<100	1.2	<10
10 BARBIZON FARMS	East	12/03/86	66	<50	<10	<10		852	<20	<50	1.4	<10	
10 BARBIZON FARMS	East	06/08/87	26	<100	<10	<10	<0.2	16	504	<20	<100	0.8	12
10 BARBIZON FARMS	E-Inlet	07/15/85		<50			<1				1.1		
10 BARBIZON FARMS	E-Inlet	06/10/87	41	<100	<100	<10	<0.2	82	224	<20	<100	0.6	<10
10 BARBIZON FARMS	Middle	06/08/87	32	<100	<10	<10	<0.2	<10	620	<20	<100	0.3	19
10 BARBIZON FARMS	Middle	12/03/86	93	<50	<10	<10		915	<20	<50	1.5	<10	
10 BARBIZON FARMS	West	06/08/87	33	<100	<10	<10	<0.2	38	752	<20	<100	1.3	46
10 BARBIZON FARMS	West	12/03/86	93	<50	<10	<10		848	<20	<50	1.5	14	
10 BARBIZON FARMS	W-Inlet	06/10/87	49	<100	<100	<10	<0.2	490	533	<20	<100	0.9	<10
10 BARBIZON FARMS	W-Inlet	07/15/85		<50			<1				1.1		
10 BARBIZON FARMS	W-Inlet	12/03/86	52	<50	<10	<10		565	<20	<50	1.2	<10	
11 TLDD, NORTH	1	06/08/87	160	<10	<10	13	<0.2	23	174	<5	<10	1.8	15
11 TLDD, NORTH	1	12/03/86	150	<10	<10	11		250	<20	<10	1.7	<10	
11 TLDD, NORTH	2A	12/03/86	180	<10	<10	<10		339	<20	<10	1.1	11	
11 TLDD, NORTH	2A	06/08/87	230	<10	<10	<10	<0.2	12	238	<5	<10	1.8	14
11 TLDD, NORTH	2B	06/08/87	180	<10	<10	<10	<0.2	13	164	<5	<10	1.9	13
11 TLDD, NORTH	2B	12/03/86	160	<10	<10	11		302	<20	<10	1.3	11	
11 TLDD, NORTH	3A	12/03/86	180	<10	<10	<10		370	<20	<10	1.2	11	
11 TLDD, NORTH	3A	06/08/87	200	<10	<10	<10	<0.2	16	227	5	<10	1.7	15
11 TLDD, NORTH	3B	06/08/87	190	<10	<10	<10	<0.2	50	184	6	<10	2.1	62
11 TLDD, NORTH	3B	12/03/86	160	<10	<10	<10		322	<20	<10	1.3	11	
11 TLDD, NORTH	4	12/03/86	200	<10	<10	<10		460	<20	<10	1.3	12	
11 TLDD, NORTH	4	06/08/87	200	<10	<10	<10	<0.2	24	256	6	<10	2.5	36
11 TLDD, NORTH	5A	06/08/87	240	<10	<10	<10	<0.2	<10	258	<5	<10	2.1	21
11 TLDD, NORTH	5A	12/03/86	220	<10	<10	<10		494	<20	<10	1.3	11	
11 TLDD, NORTH	5B	12/03/86	260	<10	<10	<10		571	<20	<10	1.5	11	
11 TLDD, NORTH	5B	06/08/87	290	<10	<10	<10	<0.2	13	420	5	<10	1.9	12
11 TLDD, NORTH	6	12/03/86	300	<10	<10	<10		655	<20	<10	1.5	11	
11 TLDD, NORTH	6	06/08/87	280	<10	<10	<10	<0.2	14	353	5	<10	1.9	13
11 TLDD, NORTH	7	06/20/85	<50				<1				2.1		
11 TLDD, NORTH	7	06/08/87	360	<100	<10	<10	<0.2	13	504	6	<10	1.1	11
11 TLDD, NORTH	7	12/03/86	480	<50	<10	<10		780	<20	<50	1.7	<10	
11 TLDD, NORTH	Inlet	12/03/86	140	<10	<10	11		286	<20	<10	1.8	12	

APPENDIX B. Trace Element Water Quality Data (cont.)

SITE NAME	CELL	DATE	As	Cd	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Se	Zn
			.....ug/L.....										
11 TLDD, NORTH	Inlet	06/08/87	170	<10	<10	16	<0.2	24	169	<5	<10	1.6	21
11 TLDD, NORTH	Inlet	06/20/85		<50			<1					2.1	
12 WESTLAKE #3	1	06/08/87	10	<100	<10	<10	<0.2	130	498	26	<100	5.3	13
12 WESTLAKE #3	1	12/03/86	37	<50	<10	<10			459	29	<50	4.7	<10
12 WESTLAKE #3	1	01/26/88	23		12	<10			286	<25	<50	3.5	9
12 WESTLAKE #3	2	06/08/87	52	<100	<10	<10	<0.2	140	348	23	<100	4.1	<10
12 WESTLAKE #3	2	01/26/88	33		10	<10			334	<25	<50	3.5	3
12 WESTLAKE #3	2	12/03/86	33	<10	<10	<10			293	<20	<10	3.4	<10
12 WESTLAKE #3	3	12/03/86	26	<10	<10	<10			254	<20	<10	2.9	<10
12 WESTLAKE #3	3	06/08/87	34	<100	<10	<10	<0.2	140	313	22	<100	4.2	<10
12 WESTLAKE #3	3	01/26/88	62		<10	<10			429	<25	<50	4.1	6
12 WESTLAKE #3	3-Inlet	12/03/86	29	<10	<10	<10			228	21	<10	3.3	<10
12 WESTLAKE #3	3-Inlet	06/08/87	62	<100	<10	14	<0.2	1000	306	32	<100	6.2	37
12 WESTLAKE #3	3-Inlet	07/15/85		<50			<1					5.1	
12 WESTLAKE #3	4	06/08/87	25	<100	<10	<10	<0.2	62	642	<20	<100	7.2	<10
12 WESTLAKE #3	4	01/26/88	120		11	<10			722	<25	<50	10.7	7
12 WESTLAKE #3	4	12/03/86	73	<50	<10	<10			848	29	<50	15	<10
12 WESTLAKE #3	4-Inlet	12/03/86	66	<50	<10	<10			702	<20	<50	25	15
12 WESTLAKE #3	5	01/26/88	75		12	<10			458	<25	<50	4.2	5
12 WESTLAKE #3	5	06/08/87	28	<100	<10	<10	<0.2	93	429	<20	<100	3.1	<10
12 WESTLAKE #3	5	12/03/86	37	<10	<10	<10			322	<20	<10	4.7	16
12 WESTLAKE #3	6	06/08/87	18	<100	<10	<10	<0.2	75	489	23	<100	4.1	12
12 WESTLAKE #3	6	01/26/88	56		10	<10			662	<25	<50	4.1	3
12 WESTLAKE #3	6	12/03/86	11	<10	<10	<10			327	<20	<10	3.9	18
13 J & W FARMS	A	06/04/85		<50			<1					37	
13 J & W FARMS	B	06/04/85		<50			<1					17	
13 J & W FARMS	B	12/03/86	16	<10	11	11			2110	<20	<10	24	16
13 J & W FARMS	B-Inlet	06/04/85		<50			<1					42	
13 J & W FARMS	C	06/04/85		<50			<1					34	
13 J & W FARMS	C	12/03/86	17	<10	<10	<10			3580	<20	<10	38	20
13 J & W FARMS	C-Inlet	06/04/85		<50			<1					36	
13 J & W FARMS	C-Inlet	12/03/86	11	<10	<10	<10			1600	<20	<10	42	20
14 PRYSE FARMS		12/03/86	730	<100	<10	<10				<20	<50	<10	
14 PRYSE FARMS	1	12/03/86	410	<50	<10	<10			2960	<20	<10	15	<10
14 PRYSE FARMS	1	06/10/87	630	<100	<10	<10	<0.2	350	2980	<20	<100	16	10
14 PRYSE FARMS	2	06/12/85		<50			<1					15	
14 PRYSE FARMS	2	06/10/87	1200	<100	<10	<10	<0.2	130	6380	28	<100	14	<10
14 PRYSE FARMS	2	12/03/86	1000	<100	<10	<10			6090	20	<50	17	<10
14 PRYSE FARMS	Inlet	06/12/85		<50			<1					42	
14 PRYSE FARMS	Inlet	06/10/87	330	<100	<10	<10	<0.2	1170	1735	<20	<100	13	<10
14 PRYSE FARMS	Inlet	12/03/86	280	<50	<10	<10			1880	<20	<10	9.7	<10
15 BOWMAN	A	12/03/86	60	<50	<10	<10			3250	<20	<50	17	<10
15 BOWMAN	A	06/09/87	66	<100	<10	<10	<0.2	80	3150	<20	<100	19	<10
15 BOWMAN	A	06/04/85		<50			<1					32	
15 BOWMAN	B	06/09/87	80	<100	<10	<10	<0.2	58	5138	<20	<100	24	<10
15 BOWMAN	NE-Inlet	06/04/85		<50			<1					37	
15 BOWMAN	NE-Inlet	06/09/87	130	<100	<10	<10	<0.2	190	1670	<20	<100	21	<10
15 BOWMAN	NE-Inlet	12/03/86	120	<50	<10	11			1690	<20	<10	23	15
15 BOWMAN	NW-Inlet	06/09/87	240	<100	<10	<10	<0.2	2830	3088	<20	<100	17	<10

APPENDIX B. Trace Element Water Quality Data (cont.)

SITE NAME	CELL	DATE	As	Cd	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Se	Zn
			.....	.....	.....	.....	.....	ug/L.....	.....	.....	.....	.....	.....
15 BOWMAN	NW-Inlet	12/03/86	200	<50	<10	<10			2650	<20	<10	15	<10
15 BOWMAN	NW-Inlet	06/04/85		<50			<1					17	
16 MORRIS FARM	Cell	12/03/86	380	<100	<10	<10			10275	<20	<50	39	<10
16 MORRIS FARM	Cell	06/09/87	100	<100	<10	<10	<0.2	26	5250	<20	<100	44	10
16 MORRIS FARM	Cell	06/12/85		<50			<1					29	
16 MORRIS FARM	Inlet	12/03/86	200	<50	<10	<10			2805	<20	<10	28	<10
16 MORRIS FARM	Inlet	06/12/85		<50			<1					39	
16 MORRIS FARM	Inlet	06/09/87	240	<100	<10	<10	<0.2	110	2875	<20	<100	76	<10
17 MARTIN FARMS	Cell	06/09/87	240	<100	<10	<10	<0.2	<10	10125	<20	<100	51	<10
17 MARTIN FARMS	Cell	12/03/86	700	<100	<10	<10			7500	<20	<50	43	17
17 MARTIN FARMS	Cell	06/12/85		<50			<1					62	
17 MARTIN FARMS	Inlet	06/12/85		<50			<1					37	
17 MARTIN FARMS	Inlet	12/03/86	220	<50	<10	<10			7775	<20	<10	37	<10
19 4-J CORP	Cell	06/10/87	2500	<100	<10	<10	<0.2	19	5595	<20	<100	53	<10
19 4-J CORP	N-Inlet	06/10/87	900	<100	<10	<10	<0.2	17	1555	<20	<100	36	<10
21 TLDD HACIENDA	A1	12/02/86	120	<10	<10	<10			1125	<20	16	7.3	<10
21 TLDD HACIENDA	A1	06/08/87	110	<10	<10	<10	<0.2	100	912	<5	<10	21	14
21 TLDD HACIENDA	A1	06/20/85		<50			<1					30	
21 TLDD HACIENDA	A1-Inlet	12/02/86							1075			7.8	
21 TLDD HACIENDA	A1-Inlet	06/08/87	130	<10	<10	<10	<0.2	210	755	<5	<10	19	15
21 TLDD HACIENDA	A2	06/08/87	110	<10	<10	<10	0.2	12	1615	<5	<10	16	14
21 TLDD HACIENDA	A2	06/08/87	100	<10	<10	<10	<0.2	22	1332	<5	<10	19	11
21 TLDD HACIENDA	A2	12/02/86							1580			12	
21 TLDD HACIENDA	A3	12/02/86							2320			13	
21 TLDD HACIENDA	A3	06/08/87	220	<50	<10	<10	<0.2	35	2185	<20	11	14	12
21 TLDD HACIENDA	A4	06/20/85		<50			<1					26	
21 TLDD HACIENDA	A4	12/02/86	490	<50	<10	<10			5870	<20	<50	17	<10
21 TLDD HACIENDA	A4	06/08/87	390	<100	<10	<10	<0.2	28	5000	<30	<50	14	<10
21 TLDD HACIENDA	C1	06/20/85		<50			<1					22	
21 TLDD HACIENDA	C1	06/09/87	100	<10	<10	<10	<0.2	73	1125	6	<10	21	14
21 TLDD HACIENDA	C1	12/02/86	120	<10	<10	<10			1085	<20	<10	9.6	14
21 TLDD HACIENDA	C1-Inlet	12/02/86							1100			9.7	
21 TLDD HACIENDA	C2	06/09/87	200	<100	<10	<10	<0.2	57	1478	<20	<10	22	<10
21 TLDD HACIENDA	C2	12/02/86							1595			10.8	
21 TLDD HACIENDA	C3	12/02/86							2820			16	
21 TLDD HACIENDA	C3	06/09/87	300	<50	<10	<10	<0.2	54	2168	<30	<50	20	11
21 TLDD HACIENDA	C4	06/20/85		<50			<1					26	
21 TLDD HACIENDA	C4	12/02/86	590	<50	<10	<10			5490	<20	<50	11	<10
21 TLDD HACIENDA	C4 NE Corner	06/09/87	480	<100	<10	<10	<0.2	31	4340	<30	<50	18	<10
21 TLDD HACIENDA	C4 SW Corner	06/09/87	490	<100	<10	<10	ND	27	4845	<30	<50	17	<10
21 TLDD HACIENDA	Marsh N Cell	06/09/87	170	<10	<10	<10	<0.2	54	962	8	<10	19	12
21 TLDD HACIENDA	Marsh S Cell	06/09/87	180	<10	<10	<10	ND	31	1142	<5	<10	20	10
22 TLDD, SOUTH	1	12/02/86							1185			12	
22 TLDD, SOUTH	1 SE Side	06/09/87	120	<100	<10	<10	<0.2	66	1320	<20	<100	23	<10
22 TLDD, SOUTH	1 SW Side	06/09/87	140	<100	<10	<10	<0.2	65	1310	<20	<100	22	15
22 TLDD, SOUTH	10	06/21/85		<50			<1					24	
22 TLDD, SOUTH	10	06/09/87	360	<100	<10	<10	<0.2	6	5925	<20	<50	14	<10
22 TLDD, SOUTH	10	12/02/86	810	<50	<10	<10			11050	22	<50	16	<10
22 TLDD, SOUTH	2	12/02/86							1415			12	

APPENDIX B. Trace Element Water Quality Data (cont.)

SITE NAME	CELL	DATE	As	Cd	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Se	Zn
		
22 TLDD, SOUTH	2	06/09/87	120	<100	<10	<10	<0.2	36	1358	<20	<100	18	14
22 TLDD, SOUTH	3	12/02/86							1600			10.1	
22 TLDD, SOUTH	3	06/09/87	160	<100	<10	<10	<0.2	37	1772	<20	<100	16	10
22 TLDD, SOUTH	4	12/02/86	360	<50	<10	<10			3390	<20	<50	17	14
22 TLDD, SOUTH	4	06/09/87	280	<100	<10	<10	<0.2	25	2670	<20	<100	15	15
22 TLDD, SOUTH	5	12/02/86							4250			17	
22 TLDD, SOUTH	5	06/09/87	290	<100	<10	<10	<0.2	23	2650	<20	<100	15	13
22 TLDD, SOUTH	6	06/09/87	140	<100	<10	<10	<0.2	35	1468	<20	<100	14	<10
22 TLDD, SOUTH	6	12/02/86							1810			11	
22 TLDD, SOUTH	7	12/02/86							2358			13	
22 TLDD, SOUTH	7	06/09/87	160	<100	<10	<10	<0.2	30	1540	<20	<100	11	11
22 TLDD, SOUTH	8	12/02/86							3025			12	
22 TLDD, SOUTH	8	06/09/87	200	<100	<10	<10	<0.2	16	2058	<20	<100	9.8	10
22 TLDD, SOUTH	9	12/02/86							3870			12	
22 TLDD, SOUTH	9	06/09/87	290	<100	<10	<10	<0.2	30	2900	<20	<100	11	<10
22 TLDD, SOUTH	Inlet	06/09/87	130	<10	<10	<10	<0.2	230	970	5	<10	19	<10
22 TLDD, SOUTH	Inlet	06/21/85		<50			<1					23	
22 TLDD, SOUTH	Inlet	12/02/86	110	<10	<10	<10			972	<20	<10	12	12
22 TLDD, SOUTH	Perim. Drain	06/09/87	90	<50	<10	<10	<0.2	1300	2625	<20	<50	4.8	<10
22 TLDD, SOUTH	Salt Basin	12/02/86	810	<50	<10	<10			10325	42	<50	24	<10
22 TLDD, SOUTH	Salt Basin	06/09/87	180	<100	<10	<10	<0.2	43	1650	<20	<100	14	13
23 LOST HILLS WD	1 North	01/26/88	9		<10	<10			1670	<25	<50	168	6
23 LOST HILLS WD	1 (a)	06/09/87	10	<100	<10	<10	<0.2	11	1600	<20	<100	199	<10
23 LOST HILLS WD	1 (a)	08/28/85		<50			<1					169	
23 LOST HILLS WD	1 (b)	08/28/85		<50			<1					165	
23 LOST HILLS WD	1 (b)	12/02/86	12	<100	<10	<10			2045	<20	<10	200	<10
23 LOST HILLS WD	1 (c)	06/09/87	10	<100	<10	<10	<0.2	30	1665	<20	<100	196	12
23 LOST HILLS WD	1 (c)	08/28/85		<50			<1					174	
23 LOST HILLS WD	1-Inlet	01/26/88	4		11	<10			785	<25	<50	197	10
23 LOST HILLS WD	1-Inlet	12/02/86							1055			198	
23 LOST HILLS WD	1-Inlet	06/09/87	3	<100	<10	<10	<0.2	<10	429	<20	<100	140	<10
23 LOST HILLS WD	1-Inlet	07/03/85		<50			<1					153	
23 LOST HILLS WD	3A	01/26/88	14		13	10			3080	<25	<50	480	8
23 LOST HILLS WD	3A	07/03/85		<50			<1					581	
23 LOST HILLS WD	3A North	06/09/87	18	<100	<10	<10	<0.2	39	2720	<20	<100	345	10
23 LOST HILLS WD	3A North	08/28/85		<50			<1					646	
23 LOST HILLS WD	3A North	12/02/86	16	<100	<10	<10			3660	<20	<50	244	<10
23 LOST HILLS WD	3A North	08/28/85		<50			<1					641	
23 LOST HILLS WD	3A South	06/09/87	16	<100	<10	<10	<0.2	23	2710	<20	<100	307	<10
23 LOST HILLS WD	3A South	08/28/85		<50			<1					591	
23 LOST HILLS WD	3A-Inlet	06/09/87	7	<100	<10	<10	<0.2	12	1665	<20	<100	645	<10
23 LOST HILLS WD	3B	01/26/88	11		23	<10			1820	<25	<50	121	15
23 LOST HILLS WD	3B North	06/09/87	11	<100	<10	<10	<0.2	43	2045	<20	<100	145	<10
23 LOST HILLS WD	3B North	08/28/85		<50			<1					122	
23 LOST HILLS WD	3B North	12/02/86	13	<50	29	<10			2000	<20	<50	85	<10
23 LOST HILLS WD	3B North	08/28/85		<50			<1					124	
23 LOST HILLS WD	3B South	08/28/85		<50			<1					112	
23 LOST HILLS WD	3B South	06/09/87	14	<100	13	<10	<0.2	170	1800	<20	<100	150	27
23 LOST HILLS WD	3B-Inlet	07/03/85		<50			<1					76	

APPENDIX B. Trace Element Water Quality Data (cont.)

SITE NAME	CELL	DATE	As	Cd	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Se	Zn
		
23 LOST HILLS WD	3C	01/26/88	9	<50	12	<10	<1	1735	<25	<50	170	2	
23 LOST HILLS WD	3C	08/28/85									2.1		
23 LOST HILLS WD	3C	12/02/86						2290			174		
23 LOST HILLS WD	3C	06/09/87	10	<100	<10	<10	<0.2	<10	1865	<20	<100	199	<10
23 LOST HILLS WD	Borrow Pit	01/26/88	<1		<10	<10		434	<25	<50	47	6	
23 LOST HILLS WD	Borrow Pit	06/09/87	8	<100	<10	10	<0.2	93	296	<20	<100	58	16
24 CARMEL RANCH	1	06/10/87	1500	<100	<10	<10	<0.2	17	4348	<20	<100	2.4	10
24 CARMEL RANCH	1-Inlet	06/10/87	800	<100	<10	<10	<0.2	260	2530	<20	<100	2.8	13
24 CARMEL RANCH	1-Inlet	05/23/85		<50			<1					2.1	
24 CARMEL RANCH	1-Inlet	12/02/86	770	<50	<10	<10		2350	<20	<50	2.1	36	
24 CARMEL RANCH	2	06/10/87	2800	<100	<10	<10	<0.2	12	9745	25	<100	3.2	11
24 CARMEL RANCH	2	12/02/86						3080			2.4		
24 CARMEL RANCH	3	06/10/87	620	<100	<10	<10	<0.2	<10	3020	<20	<100	3.7	14
24 CARMEL RANCH	4	06/10/87	360	<100	<10	<10	<0.2	26	1880	<20	<100	3.8	13
24 CARMEL RANCH	4A-Inlet	05/23/85		<50			<1				2.1		
24 CARMEL RANCH	4B-Inlet	05/23/85		<50			<1				4.1		
24 CARMEL RANCH	5	12/02/86						2425			2.3		
24 CARMEL RANCH	5	06/10/87	13000	<100	<10	<10	<0.2	<10	39900	57	<100	5.4	<10
24 CARMEL RANCH	6	05/23/85		<50			<1				1.1		
25 LOST HILLS RANCH	1	06/10/87	960	<100	<10	<10	<0.2	23	2940	<20	<100	3.1	18
25 LOST HILLS RANCH	1	05/29/85		<50			<1				8.1		
25 LOST HILLS RANCH	1	12/02/86	910	<50	<10	<10		3020	<20	<10	2.1	19	
25 LOST HILLS RANCH	1-Inlet	06/10/87	860	<100	<10	<10	<0.2	31	2640	<20	<100	3.2	14
25 LOST HILLS RANCH	2	12/02/86	960					3755			3.1		
25 LOST HILLS RANCH	2	06/10/87		<100	<10	<10	<0.2	<10	5015	<20	<100	2.6	22
25 LOST HILLS RANCH	3	06/10/87	820	<100	<10	<10	<0.2	11	6980	<20	<100	3.3	11
25 LOST HILLS RANCH	3	12/02/86	2300	<50	<10	<10		5805	<20	<50	5.2	18	
25 LOST HILLS RANCH	3	05/29/85		<50			<1				10		
26 SAM ANDREWS' SONS	1	06/11/87	13	<100	<10	<10	0.2	11	8705	<20	<100	802	17
26 SAM ANDREWS' SONS	1	12/18/86	3	<50	<10	<10		2140	<20	<10	234	<10	
26 SAM ANDREWS' SONS	1-Inlet	12/18/86	5	<50	<10	<10		316	<20	<10	345	15	
26 SAM ANDREWS' SONS	1-Inlet	06/17/85		<50			<1				205		
26 SAM ANDREWS' SONS	2A	06/11/87	4	<100	<10	<10	<0.2	<10	2580	<20	<100	366	15
26 SAM ANDREWS' SONS	2B	06/11/87	5	<100	<10	<10	<0.2	11	2090	<20	<100	303	41
26 SAM ANDREWS' SONS	3A	06/11/87	13	<100	<10	<10	<0.2	14	2670	<20	<100	359	25
26 SAM ANDREWS' SONS	3B	12/18/86	5	<100	<10	<10		4040	<20	<50	579	<10	
26 SAM ANDREWS' SONS	3B	06/11/87	7	<100	<10	<10	0.2	<10	3480	<20	<100	455	13
26 SAM ANDREWS' SONS	4A	12/18/86	11	<100	<10	<10		13100	<20	64	940	<10	
26 SAM ANDREWS' SONS	4A	06/11/87	9	<100	<10	<10	0.2	<10	5088	<20	<100	606	<10
26 SAM ANDREWS' SONS	4A	06/17/85		<50			<1				661		
26 SAM ANDREWS' SONS	4B	06/11/87	8	<100	<10	<10	<0.2	15	4310	<20	<100	505	<10
26 SAM ANDREWS' SONS	4B	06/11/87	13	<100	<10	<10	<0.2	11	4360	<20	<100	492	<10
26 SAM ANDREWS' SONS	4B	12/18/86	12	<100	<10	<10		13250	<20	<50	978	<10	

APPENDIX C

APPENDIX C. Sediment Data

SITE NAME	CELL	DATE	Hg	As	Se	Cu	Zn	Ni	Mo	Cd	Cr	Sr	Ba	Pb	V
mg/kg															
3 BRITZ SPD	South	12/04/86	<0.05	3.30	3.50	8	14	10	10	<1	17	485	62	<5	18
4 SUMNER PECK	1	12/02/86	<0.05	9.18	4.43	38	100	70	2	<1	48	146	346	22	90
4 SUMNER PECK	1	06/09/87	0.05	7.70	4.75	22	69	38	<1	<1	47	124	287	13	67
4 SUMNER PECK	2	12/02/86	<0.05	7.40	10.10	29	90	47	1	<1	36	190	298	20	63
4 SUMNER PECK	2	06/09/87	<0.05	8.75	4.40	28	84	45	<1	<1	32	143	333	16	76
4 SUMNER PECK	3	12/02/86	<0.05	8.00	6.05	27	88	47	1	<1	32	146	314	21	76
4 SUMNER PECK	3	06/09/87	<0.05	6.95	10.85	26	69	36	<1	<1	27	141	309	13	65
4 SUMNER PECK	4	06/09/87	<0.05	5.25	7.25	17	51	28	<1	<1	23	223	210	10	41
4 SUMNER PECK	4	12/02/86	0.05	8.45	5.70	31	99	48	1	<1	34	167	338	23	81
4 SUMNER PECK	5	12/02/86	0.05	5.25	5.25	17	54	33	1	<1	41	181	185	12	39
4 SUMNER PECK	6	06/09/87	<0.05	9.40	4.45	31	94	47	<1	<1	32	129	388	25	85
5 BRITZ-DEAV 5PTS	North	12/02/86	<0.05	6.20	12.50	36	55	71	4	<1	48	354	184	13	40
5 BRITZ-DEAV 5PTS	North	06/08/87	<0.05	7.45	8.20	30	65	82	<1	<1	55	161	222	11	64
5 BRITZ-DEAV 5PTS	South	12/02/86	0.10	5.90	25.70	44	76	91	20	<1	54	192	183	18	48
5 BRITZ-DEAV 5PTS	South	06/08/87	0.10	8.25	1.50	26	61	78	<1	<1	62	92	238	<5	70
5 BRITZ-DEAV 5PTS	South	12/02/86	<0.05	6.50	39.75	37	83	41	1	<1	26	298	255	18	46
6 STONE LAND CO.	North (a)	06/08/87	0.20	6.60	0.10	28	58	80	<1	<1	45	134	220	<5	67
6 STONE LAND CO.	North (b)	12/02/86	0.10	6.55	0.35	34	67	79	13	<1	52	523	230	16	60
6 STONE LAND CO.	North (b)	06/08/87	<0.05	6.80	0.15	31	66	76	<1	<1	46	234	253	<5	71
6 STONE LAND CO.	SE (a)	06/08/87	0.15	8.65	0.10	38	72	84	<1	<1	44	215	236	9	64
6 STONE LAND CO.	SE (a)	12/02/86	0.10	5.15	0.10	27	55	62	3	<1	31	142	96	13	43
6 STONE LAND CO.	SE (b)	06/08/87	0.10	7.45	0.20	31	67	69	<1	<1	33	186	183	<5	55
6 STONE LAND CO.	SW (a)	06/08/87	0.05	4.15	0.30	28	63	69	3	<1	39	195	192	7	46
6 STONE LAND CO.	SW (b)	06/08/87	<0.05	3.30	0.35	24	54	66	2	<1	37	532	192	<5	36
6 STONE LAND CO.	SW (b)	12/02/86	0.08	2.98	0.75	29	54	65	22	<1	34	>800	190	12	42
7 CARLTON DUTY	Basin	12/03/86	0.08	3.23	1.83	14	23	26	36	<1	30	779	64	8	24
7 CARLTON DUTY	Basin	06/08/87	<0.05	2.70	1.70	13	34	36	15	<1	35	659	111	7	30
8 WESTLAKE-NORTH	1-N		<0.05	3.55	0.05	13	38	19	13	<1	22	177	112	<5	43
8 WESTLAKE-NORTH	1-N	06/08/87	<0.05	2.50	0.20	8	25	12	2	<1	26	136	70	<5	31
8 WESTLAKE-NORTH	1-N	06/08/87	0.20	4.05	0.10	19	55	32	<1	<1	30	84	150	8	53
8 WESTLAKE-NORTH	2-NE	06/08/87	<0.05	2.30	0.05	5	17	7	3	<1	14	89	36	<5	21
8 WESTLAKE-NORTH	2-NW		0.05	3.65	0.35	12	37	19	5	<1	22	191	86	<5	40
8 WESTLAKE-NORTH	2-SE	06/08/87	<0.05	2.55	0.50	6	18	8	3	<1	24	794	47	<5	27
8 WESTLAKE-NORTH	2-SW	06/08/87	<0.05	2.10	0.55	7	21	11	3	<1	17	410	51	<5	26
9 MEYERS RANCH	A	12/03/86	0.10	2.35	<0.01	9	33	17	1	<1	22	123	95	7	48
9 MEYERS RANCH	A	06/08/87	<0.05	3.40	0.30	10	26	12	10	<1	22	492	96	<5	34
9 MEYERS RANCH	B	12/03/86	0.10	2.10	<0.01	6	18	9	6	<1	18	253	67	<5	26
9 MEYERS RANCH	B	06/08/87	<0.05	3.30	0.25	12	34	29	<1	<1	26	267	102	27	45
9 MEYERS RANCH	B (algae)	12/03/86	0.15	9.85	0.95	15	27	15	6	<1	25	434	78	6	39
9 MEYERS RANCH	B (org. matter)	06/08/87	<0.50**	7.40	1.05	14	29	16	47	<1	21	>800	86	6	51
9 MEYERS RANCH	C	12/03/86	<0.05	3.45	0.70	6	17	7	2	<1	21	111	57	<5	23
9 MEYERS RANCH	C	06/08/87	<0.05	3.50	0.15	13	40	24	3	<1	25	211	127	6	59
10 BARBIZON FARMS	East	12/03/86	0.05	7.15	0.45	17	42	22	13	<1	30	449	129	<5	68
10 BARBIZON FARMS	East	06/08/87	<0.05	2.79	0.15	14	28	15	1	<1	19	96	85	5	35
10 BARBIZON FARMS	Middle	12/03/86	0.05	7.70	0.55	15	34	20	11	<1	28	509	103	<5	65
10 BARBIZON FARMS	Middle	06/08/87	<0.05	1.65	0.15	5	14	6	2	<1	16	36	38	<5	19
10 BARBIZON FARMS	West	12/03/86	0.05	13.50	0.70	19	37	23	17	<1	28	>800	131	8	74
10 BARBIZON FARMS	West	06/08/87	<0.05	5.85	0.45	17	43	26	10	<1	31	77	127	9	50
11 TLDD, North	1	12/03/86	0.07	27.13	1.73	21	22	20	13	<1	26	>800	137	10	173
11 TLDD, North	1	06/08/87	<0.05	7.90	0.90	15	39	23	<1	<1	18	284	108	<5	52

APPENDIX C. Sediment Data (cont.)

SITE NAME	CELL	DATE	Hg	As	Se	Cu	Zn	Ni	Mo	Cd	Cr	Sr	Ba	Pb	V
			----- mg/kg-----												
11 TLDD, North	2A	12/03/86	0.10	28.20	0.45	16	38	21	14	<1	18	528	104	6	82
11 TLDD, North	2A	06/08/87	<0.05	5.90	0.30	4	12	6	<1	<1	11	99	35	<5	29
11 TLDD, North	2B	12/03/86	0.10	34.10	0.80	20	29	24	11	1	25	>800	123	11	164
11 TLDD, North	2B	06/08/87	<0.05	21.50	0.50	9	22	12	2	<1	14	787	85	<5	65
11 TLDD, North	3A	12/03/86	0.10	11.45	0.75	14	37	27	12	<1	29	364	134	6	65
11 TLDD, North	3A	06/08/87	<0.05	7.70	0.40	9	26	13	3	<1	13	185	71	<5	41
11 TLDD, North	3B	12/03/86	0.10	11.15	0.45	8	19	16	2	<1	24	356	88	<5	68
11 TLDD, North	3B	06/08/87	<0.05	28.75	0.85	27	51	26	8	<1	22	>800	168	<5	118
11 TLDD, North	4	12/03/86	0.20	23.65	1.10	25	54	46	41	<1	39	514	148	9	84
11 TLDD, North	4	06/08/87	<0.05	7.35	0.60	7	22	10	3	<1	13	103	54	<5	35
11 TLDD, North	5A	12/03/86	0.05	11.85	0.60	15	47	30	5	<1	30	175	147	7	59
11 TLDD, North	5A	06/08/87	<0.05	7.55	0.30	9	24	12	2	<1	12	145	68	<5	32
11 TLDD, North	5B	12/03/86	<0.05	32.10	0.50	14	34	29	15	<1	22	544	97	6	70
11 TLDD, North	5B	06/08/87	<0.05	12.35	0.35	10	30	18	<1	<1	17	162	77	<5	36
11 TLDD, North	6	12/03/86	0.10	15.95	0.75	33	73	40	15	<1	35	246	194	12	74
11 TLDD, North	6	06/08/87	<0.05	13.75	0.45	20	58	28	9	<1	20	220	158	<5	55
11 TLDD, North	7	12/03/86	0.10	12.30	0.40	23	385	50	14	<1	42	233	153	7	47
11 TLDD, North	7	06/08/87	<0.05	12.10	0.35	26	63	39	1	<1	24	185	205	<5	60
12 WESTLAKE #3	1	12/03/86	0.10	6.70	0.40	14	33	41	2	<1	47	63	115	<5	42
12 WESTLAKE #3	1	06/08/87	<0.05	5.25	0.10	10	31	33	<1	<1	78	68	105	<5	41
12 WESTLAKE #3	2	12/03/86	0.10	2.55	0.45	19	47	52	2	<1	48	130	206	<5	46
12 WESTLAKE #3	2	06/08/87	<0.05	10.55	0.25	23	51	70	<1	<1	62	80	206	8	58
12 WESTLAKE #3	3	12/03/86	0.13	8.34	0.53	30	68	81	7	<1	52	182	205	7	56
12 WESTLAKE #3	3	06/08/87	0.10	10.45	0.20	29	64	80	<1	<1	61	127	193	9	67
12 WESTLAKE #3	4	12/03/86	0.20	9.90	0.40	29	61	79	2	<1	49	123	211	<5	67
12 WESTLAKE #3	4	06/08/87	0.05	15.40	0.45	19	44	58	1	<1	47	255	150	6	50
12 WESTLAKE #3	5	12/03/86	0.15	10.35	0.35	26	70	72	2	<1	60	119	231	<5	65
12 WESTLAKE #3	5	06/08/87	<0.05	6.30	0.05	10	27	32	<1	<1	61	71	86	<5	35
12 WESTLAKE #3	6	12/03/86	0.10	6.75	0.40	23	50	65	2	<1	46	86	986	<5	57
12 WESTLAKE #3	6	06/08/87	0.10	9.13	0.18	19	44	53	<1	<1	58	79	183	7	51
13 J & W FARMS	C	12/03/86	0.05	10.97	16.45	36	72	37	204	<1	34	365	179	12	76
14 PRYSE FARMS	1	12/03/86	0.05	11.50	0.45	24	53	26	32	<1	32	361	214	<5	61
14 PRYSE FARMS	1	06/10/87	<0.05	12.55	1.80	13	30	12	30	<1	19	>800	108	<5	52
14 PRYSE FARMS	2	12/03/86	<0.05	33.10	2.10	15	29	14	160	<1	20	>800	103	8	67
14 PRYSE FARMS	2	06/10/87	<0.05	19.40	1.70	11	30	12	74	<1	14	>800	116	<5	52
15 BOWMAN FARMS	A	12/03/86	<0.05	63.00	10.40	14	24	11	143	2	20	>800	70	8	96
15 BOWMAN FARMS	A	06/09/87	<0.05	37.00	9.40	16	31	12	149	<1	17	>800	94	<5	78
15 BOWMAN FARMS	B	06/09/87	0.10	17.00	1.95	20	50	22	51	<1	15	713	168	<5	43
16 MORRIS FARMS	Cell	12/03/86	<0.05	18.65	8.10	20	42	22	235	1	25	>800	120	6	64
16 MORRIS FARMS	Cell	06/09/87	0.10	24.15	8.70	18	34	14	129	<1	20	>800	106	<5	66
17 MARTIN FARMS	Cell	12/03/86	<0.05	61.00	11.85	20	32	16	414	<1	24	>800	112	7	83
17 MARTIN FARMS	Cell	06/09/87	<0.05	69.50	12.60	18	32	14	417	<1	20	>800	113	<5	84
18 SMITH FARMS	Cell	12/03/86	<0.05	16.05	1.55	34	69	44	31	<1	39	306	207	<5	78
19 4-J CORP	Cell	06/10/87	<0.05	76.00	3.45	17	27	6	45	<1	15	>800	94	5	362
20 NICKEL	Cell	06/10/87	<0.05	57.50	2.30	14	35	16	202	<1	20	681	142	<5	57
21 TLDD HACIENDA	A1	12/02/86	0.10	21.20	5.00	15	26	10	27	<1	20	>800	88	6	52
21 TLDD HACIENDA	A1	06/08/87	<0.05	8.35	1.65	7	17	5	18	<1	11	394	51	<5	28
21 TLDD HACIENDA	A1 (0-1.5")	06/08/87	<0.05	10.40	1.95	8	20	8	10	<1	15	435	54	<5	33
21 TLDD HACIENDA	A1 (1.5-3")	06/08/87	<0.05	2.05	0.60	7	18	9	5	<1	15	102	51	<5	26
21 TLDD HACIENDA	A2	06/08/87	<0.05	4.45	1.35	5	13	4	6	<1	10	342	44	<5	21

APPENDIX C. Sediment Data (cont.)

SITE NAME	CELL	DATE	Hg	As	Se	Cu	Zn	Ni	Mo	Cd	Cr	Sr	Ba	Pb	V
			.....mg/kg.....												
21 TLDD HACIENDA	A2 (0-2")	06/08/87	<0.05	10.75	1.45	6	18	7	9	<1	14	267	55	<5	28
21 TLDD HACIENDA	A2 (2-6")	06/08/87	<0.05	5.65	1.65	10	28	12	12	<1	19	346	86	<5	36
21 TLDD HACIENDA	A3	06/08/87	<0.05	8.05	0.85	8	24	4	18	<1	8	42	43	<5	30
21 TLDD HACIENDA	A4	12/02/86	0.05	10.90	0.55	12	34	5	20	<1	7	88	51	<5	28
21 TLDD HACIENDA	A4	06/08/87	<0.05	10.90	0.65	7	20	4	34	<1	6	139	40	<5	22
21 TLDD HACIENDA	C1	12/02/86	<0.05	22.30	6.80	16	26	10	31	<1	20	>800	78	9	70
21 TLDD HACIENDA	C1	06/09/87	<0.05	5.40	0.80	6	15	3	15	<1	6	91	36	<5	21
21 TLDD HACIENDA	C2	06/09/87	<0.05	8.10	1.05	12	29	6	31	<1	7	149	57	<5	30
21 TLDD HACIENDA	C3	06/09/87	<0.05	4.40	0.45	9	26	6	11	<1	8	72	51	<5	29
21 TLDD HACIENDA	C4	12/02/86	<0.05	13.90	0.85	8	21	4	39	<1	7	143	44	<5	21
21 TLDD HACIENDA	C4 NE Corner	06/09/87	<0.05	7.00	0.30	7	21	4	11	<1	6	92	43	<5	21
21 TLDD HACIENDA	C4 SW Corner	06/09/87	<0.05	12.50	0.80	12	35	5	77	<1	9	224	67	<5	32
21 TLDD HACIENDA	Marsh N Cell	06/09/87	<0.05	11.05	1.55	20	50	14	<1	<1	17	492	139	<5	51
21 TLDD HACIENDA	Marsh S Cell	06/09/87	<0.05	8.70	3.70	24	58	9	2	<1	13	>800	124	<5	58
22 TLDD, SOUTH	1	06/09/87	0.05	4.50	0.70	10	23	8	20	<1	11	257	59	<5	30
22 TLDD, SOUTH	1 SE Side	06/09/87	<0.05	2.75	0.55	3	13	3	4	<1	9	262	53	<5	16
22 TLDD, SOUTH	1 SW Side	06/09/87	0.05	4.05	1.15	8	25	10	4	<1	11	371	70	<5	27
22 TLDD, SOUTH	10	12/02/86	0.07	18.15	1.10	14	32	16	86	<1	16	448	74	6	27
22 TLDD, SOUTH	10	06/09/87	<0.05	4.05	0.40	6	18	8	11	<1	13	383	70	<5	22
22 TLDD, SOUTH	2	06/09/87	<0.05	6.90	0.95	14	36	14	4	<1	21	417	143	<5	40
22 TLDD, SOUTH	3	06/09/87	<0.05	7.65	1.35	11	26	9	19	<1	17	505	136	<5	33
22 TLDD, SOUTH	4	12/02/86	0.10	11.55	2.10	16	41	16	92	<1	21	282	122	5	46
22 TLDD, SOUTH	4	06/09/87	<0.05	8.45	0.30	16	42	15	3	<1	18	251	132	<5	47
22 TLDD, SOUTH	5	06/09/87	<0.05	4.45	0.75	12	36	13	12	<1	21	325	117	<5	35
22 TLDD, SOUTH	6	06/09/87	<0.05	5.95	1.05	9	25	8	6	<1	14	349	103	<5	29
22 TLDD, SOUTH	9	06/09/87	<0.05	2.95	0.20	4	14	5	5	<1	9	130	56	<5	17
22 TLDD, SOUTH	Salt Basin	12/02/86	0.05	19.10	2.75	13	29	14	130	<1	14	704	64	6	41
22 TLDD, SOUTH	Salt Basin	06/09/87	<0.05	3.65	0.95	5	16	6	10	<1	10	237	60	<5	23
23 LOST HILLS WD	1 (a)	06/09/87	<0.05	5.85	2.80	21	55	33	<1	<1	21	259	166	<5	37
23 LOST HILLS WD	1 (c)	06/09/87	<0.05	1.90	2.85	11	28	16	2	<1	18	285	109	<5	25
23 LOST HILLS WD	3A-North		<0.05	6.50	3.05	30	74	45	4	<1	40	169	208	<5	55
23 LOST HILLS WD	3A-North	06/09/87	<0.05	8.90	1.00	26	63	41	<1	<1	30	136	196	<5	62
23 LOST HILLS WD	3A-South	06/09/87	<0.05	7.45	1.30	26	71	42	<1	<1	32	131	224	11	63
23 LOST HILLS WD	3B-North	06/09/87	<0.05	6.10	0.80	19	50	32	<1	<1	32	106	158	<5	53
23 LOST HILLS WD	3B-South	06/09/87	0.05	5.95	1.00	19	47	28	<1	<1	30	93	159	<5	49
23 LOST HILLS WD	3C	06/09/87	<0.05	5.50	2.60	24	59	34	<1	<1	21	250	181	<5	37
24 CARMEL RANCH	1	06/10/87	<0.05	35.00	0.45	16	41	14	65	<1	18	>800	133	<5	98
24 CARMEL RANCH	2		0.05	43.00	0.35	19	37	14	118	<1	19	393	87	<5	50
24 CARMEL RANCH	2	06/10/87	<0.05	35.50	0.50	26	61	21	66	<1	21	433	179	<5	79
24 CARMEL RANCH	3 (0-1.5")	06/10/87	<0.05	47.50	1.45	81	47	16	109	<1	20	>800	149	<5	154
24 CARMEL RANCH	3 (1.5-3")	06/10/87	<0.05	28.75	0.80	20	51	53	<1	<1	20	553	172	<5	84
24 CARMEL RANCH	4	06/10/87	<0.05	46.50	0.85	15	36	12	15	<1	16	>800	117	<5	71
24 CARMEL RANCH	5	06/10/87	<0.05	56.00	0.15	15	39	14	32	<1	19	519	138	<5	64
24 CARMEL RANCH	6	06/10/87	<0.05	12.65	0.10	14	39	14	7	<1	19	409	123	<5	49
25 LOST HILLS RANCH	1	06/10/87	<0.05	40.50	0.50	22	57	21	10	<1	21	511	181	<5	82
25 LOST HILLS RANCH	2	06/10/87	<0.05	47.00	0.60	21	55	22	8	<1	22	389	145	<5	113
25 LOST HILLS RANCH	3		<0.05	69.00	0.40	17	39	20	30	<1	23	433	101	5	86
25 LOST HILLS RANCH	3	06/10/87	<0.05	42.45	0.35	15	33	20	37	<1	28	226	94	<5	62
26 SAM ANDREW'S SONS	1	12/18/86	0.10	6.35	10.40	18	65	19	17	1	28	351	126	7	46
26 SAM ANDREW'S SONS	1	06/10/87	<0.05	9.45	2.95	21	83	25	3	<1	45	123	163	<5	61

APPENDIX C. Sediment Data (cont.)

SITE NAME	CELL	DATE	Hg	As	Se	Cu	Zn	Ni	Mo	Cd	Cr	Sr	Ba	Pb	V
			mg/kg.....												
26 SAM ANDREW'S SONS 2A		12/18/86	<0.05	8.05	3.60	20	71	21	3	<1	22	214	143	<5	40
26 SAM ANDREW'S SONS 2B		12/18/86	<0.05	6.90	11.80	19	63	19	11	<1	23	394	88	<5	41
26 SAM ANDREW'S SONS 2B		06/10/87	<0.05	7.95	3.65	19	63	20	2	<1	28	369	138	<5	41
26 SAM ANDREW'S SONS 3A		06/10/87	<0.05	9.30	3.85	18	64	20	4	<1	31	284	136	<5	41
26 SAM ANDREW'S SONS 3B		12/18/86	0.05	11.10	3.50	24	91	27	4	<1	27	186	166	<5	47
26 SAM ANDREW'S SONS 3B		12/18/86	0.05	10.90	2.65	26	86	26	4	<1	30	163	160	11	50
26 SAM ANDREW'S SONS 3B		06/10/87	<0.05	9.00	3.95	22	82	25	5	<1	35	163	158	<5	51
26 SAM ANDREW'S SONS 4A		12/18/86	0.10	6.75	12.65	16	56	18	5	<1	21	401	106	<5	28
26 SAM ANDREW'S SONS 4A		06/10/87	0.05	9.20	1.20	22	77	25	3	<1	25	125	152	<5	45
26 SAM ANDREW'S SONS 4B		12/18/86	0.10	7.45	2.65	19	64	20	8	<1	21	305	76	<5	33
26 SAM ANDREW'S SONS 4B		06/10/87	<0.05	6.65	7.35	15	52	17	9	<1	30	335	106	<5	34